



## Physical Public Benefits

# **REVISED A2.1:** **Ecosystem Benefits Exhibits**

## Temperance Flat Reservoir Project



~~August 2017~~February 2018

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## EXHIBIT MODELING SOURCES AND DATA PROCESSING APPROACH

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For explanation and supporting documentation on the life stage timing for spring-run Chinook salmon, see *BCMR REVISED A5: Modeling Approach, Chapter 5 Ecosystem Modeling, Page 5-1*.

### Exhibits 2, 3, and 4: Temperature Threshold Analysis – Current, 2030, and 2070 Conditions

Model Source: River Temperature Model (SJR5Q)

Model Reference: *BCMR REVISED A5: Modeling Approach, Chapter 4 Temperature Modeling, Page 4-1*.

#### Data Summary:

Part A	Part B	Part C	Part D/range	Part E	Part F
<u>Current Conditions</u>					
DCR2015BASE	Reach01_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	Reach03_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	Reach05_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	Reach06_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	Reach09_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	Reach11_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	Reach16_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	Reach01_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	Reach03_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	Reach05_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	Reach06_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	Reach09_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	Reach11_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	Reach16_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
<u>2030 Conditions</u>					
CWC2030BASE	Reach01_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	Reach03_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	Reach05_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	Reach06_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	Reach09_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	Reach11_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	Reach16_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	Reach01_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	Reach03_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	Reach05_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	Reach06_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	Reach09_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	Reach11_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	Reach16_U	TEMP_F_7_DAY_MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
<u>2070 Conditions</u>					

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Part A	Part B	Part C	Part D/range	Part E	Part F
CWC2070BASE	Reach01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	Reach03 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	Reach05 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	Reach 06 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	Reach 09 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	Reach 11 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	Reach 16 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	Reach01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	Reach03 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	Reach05 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	Reach 06 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	Reach 09 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	Reach 11 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	Reach 16 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
Note: Part A: BASE indicates the without-project condition for each simulation TEMPFLATV4 indicate the with-project condition for each simulation Part B: ReachXX U represents the upstream reach condition from the SJR5Q model					

### Data Discussion:

SJR5Q outputs river temperature data in 6-hour temperature increments for each reach location. For temperature threshold analysis, the 6-hour temperature is summarized into daily maximum temperatures. These daily maximum temperatures are further summarized into 7-day average maximum (7DADM) temperatures for each reach. These 7DADM temperatures for each reach are used in temperature threshold analysis to compare the without-project and with-project condition effects on temperatures downstream of Friant Dam. For more details on the SJR5Q model and data output see the above model reference.

### Temperature threshold analysis process:

1. Identify the number of days in the fish life stage and temperature analysis for spring-run and fall-run Chinook salmon (see Exhibit 1, Table 1-1).
2. Count the number of days that the temperature threshold is exceeded for the without-project and with-project condition.
3. Divide the value from Step 2 by the 24-year period of record (1980-2003) to obtain the average annual count.
4. To calculate the percent change, take the percent difference from the Without-Project to With-Project. Formula:  $(\text{With-Project Count} / \text{Number of days}) - (\text{Without-Project Count} / \text{Number of Days})$ . A positive percent change means that the With-Project condition has fewer days when the temperature threshold is exceeded compared to the Without-Project condition. A negative percent change means that the With-Project condition has more days when the temperature threshold is exceeded compared to the Without-Project condition.
5. This process is repeated for each fish life stage and reach location

6. Steps 1 through 5 are completed for all water years and by Restoration water year type (i.e. dry, normal-dry, normal-wet, wet).

7. This process is repeated for current, 2030, and 2070 conditions.

**Exhibits 5, 6, and 7: Temperature Exceedence Analysis – Current, 2030, and 2070 Conditions**

Model Source: River Temperature Model (SJR5Q)

Model Reference: *BCMR REVISED A5: Modeling Approach, Chapter 4 Temperature Modeling, Page 4-1.*

**Data Summary:**

Part A	Part B	Part C	Part D/range	Part E	Part F
<b>Current Conditions</b>					
DCR2015BASE	REACH01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
<b>2030 Conditions</b>					
CWC2030BASE	REACH01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
<b>2070 Conditions</b>					
CWC2070BASE	REACH01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH01 U	TEMP F 7 DAY MAX	01JAN1980-01JAN2003	1DAY	RIVTEMP
<b>Note:</b> Part A: BASE indicates the without-project condition for each simulation TEMPFLATV4 indicate the with-project condition for each simulation Part B: ReachXX U represents the upstream reach condition from the SJR5Q model					

**Data Discussion:**

SJR5Q outputs river temperature data in 6-hour temperature increments for each reach location. For temperature threshold analysis, the 6-hour temperature is summarized into daily maximum temperatures. These daily maximum temperatures are further summarized into 7-day average maximum (7DADM) temperatures for each reach. These 7DADM temperatures for each reach are used in temperature exceedence analysis to compare the without-project and with-project condition effects on temperatures released from Friant Dam. For more details on the SJR5Q model and data output see the above model reference.

**Temperature Exceedence Analysis process:**

1. The Reach01 U 7DADM for all water years for the without-project and with-project condition is ranked from highest to lowest
2. To show exceedence, percentage values are assigned to the ranked Reach01 U 7DADM data, starting from 0% for the highest data value to 100% for the lowest data value.

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3. The ranked Reach01\_U data is plotted against the assigned percentage value to show the temperature exceedence curve for the without-project and with-project condition.
4. This process is repeated for current, 2030, and 2070 conditions.

### **Exhibit 8: Cold Water Pool Analysis**

Model Source: River Temperature Model (SJR5Q)

Model Reference: BCMR REVISED A5: Modeling Approach Attachment, Chapter 4 Temperature Modeling, Page 4-1

#### Data Summary:

<u>Spreadsheet</u>	<u>Project Condition</u>
<u>Current Condition</u>	
<u>For ICF_DCR2015_Base</u>	<u>Without-Project</u>
<u>For ICF_DCR2015TEMPFLATV4</u>	<u>With-Project</u>
<u>2030 Condition</u>	
<u>For ICF_CWC2030</u>	<u>Without-Project</u>
<u>For ICF_CWC2030TEMPFLATV4</u>	<u>With-Project</u>
<u>2070 Condition</u>	
<u>For ICF_CWC2070Base</u>	<u>Without-Project</u>
<u>For ICF_CWC2070TEMPFLATV4</u>	<u>With-Project</u>

#### Data Discussion:

Each spreadsheet summarized above is the processed SJR5Q outputs converted into mean daily flow and mean maximum daily temperature by Restoration water year type (wet, normal-wet, normal-dry, and dry) by reach location for raw data input for the EDT model. The mean daily flow is the flow at the upstream location of Reach 1 (Reach01\_U) computed from the River Temperature Model output. The mean maximum daily temperatures were computed based on the average of the upstream and downstream reach location (i.e. mean maximum daily temperature of Reach 1 is the average of Reach01\_U and downstream location of Reach 1 (Reach01\_D) from the River Temperature Model output). Reach 1 represents the location just below Friant Dam. For cold water pool analysis, the mean maximum daily temperatures for wet water year type is analyzed at Reach 1 for without-project and with-project condition. For more details on the SJR5Q model and data output see the above model reference.

#### Cold Water Pool Analysis process:

1. Take the without-project and with-project Reach 1 mean maximum daily temperature for wet year types and convert from degrees Fahrenheit to degrees Celsius.
2. The without-project and with-project convert values from Step 1 are then plotted on a one-year time series.
3. This process is repeated for current, 2030, and 2070 conditions.

**Exhibit 9: EDT Results**

For further details on the EDT model and assumptions, see *BCMR REVISED A5: Modeling Approach Attachment, Chapter 5 Ecosystem Modeling, Page 5-1.*

**Exhibits 11, 12, and 13: Flow Exceedence – Current, 2030, and 2070 Conditions**

Model Source: Daily Model

Model Reference: *BCMR REVISED A5: Modeling Approach, Chapter 3 Operations Modeling, Page 3-1.*

Data Summary:

Part A	Part B	Part C	Part D/range	Part E	Part F
<u>Current Conditions</u>					
<u>DCR2015BASE</u>	<u>Millerton</u>	<u>Rel-Outlet_Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>DCR2015BASE</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>DCR2015TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Outlet_Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>DCR2015TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>2030 Conditions</u>					
<u>CWC2030BASE</u>	<u>Millerton</u>	<u>Rel-Outlet_Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2030BASE</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2030TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Outlet_Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2030TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>2070 Conditions</u>					
<u>CWC2070BASE</u>	<u>Millerton</u>	<u>Rel-Outlet_Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2070BASE</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2070TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Outlet_Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2070TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>Note:</u> <u>Part A:</u> BASE indicates the without-project condition for each simulation TEMPFLATV4 indicates the with-project condition for each simulation <u>Part B:</u> Rel-Outlet_Total indicates the total outlet release out of Friant Dam (Millerton) Rel-Spill indicates the spills out of Friant Dam (Millerton)					

Data Discussion:

Daily Model is an Excel-based daily operation model to disaggregate monthly water operations into a daily set of water operations for use in further analyses. The without-project operations reads monthly CalSim II water operations whereas the with-project operations reads monthly GamingTool water operations. For flow exceedence analysis, the sum of total release from Friant Dam and spills from Friant Dam is compared between the without-project and with-project condition. For more details on CalSim II, GamingTool and Daily Model outputs see the above model reference.

Flow Exceedence Analysis process:

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1. The Rel-Outlet Total and Rel-Spill is summed for the without-project and with-project condition to get the total flow release from Friant Dam.
2. The summed total release from Friant Dam for without-project and with-project condition is ranked from highest to lowest.
3. To show exceedence, percentage values are assigned to the ranked summed total release data, starting from 0% for the highest data value to 100% for the lowest data value.
4. The ranked summed total release data is plotted against the assigned percentage value to show the flow exceedence curve for the without-project and with-project condition.
5. This process is repeated for current, 2030, and 2070 conditions.
6. These figure tells three key pieces of information:
  - a. High inflows are reduced in the with-project condition. These high inflows would be stored in Temperance Flat Reservoir (TFR). All releases would meet the SJRRP Restoration Flow requirements.
  - b. Middle inflows are increased in the with-project condition. These flows from TFR project would supplement flow in the San Joaquin River (SJR) above the SJRRP Restoration Flow requirements.
  - c. Low inflows are maintained in the with-project condition. These flow releases to the SJR would be SJRRP Restoration Flows.

### Exhibits 14, 15, and 16: Monthly Average Flow – Current, 2030, and 2070 Conditions

Model Source: Daily Model

Model Reference: *BCMR REVISED A5: Modeling Approach, Chapter 3 Operations Modeling, Page 3-1.*

Data Summary:

<u>Part A</u>	<u>Part B</u>	<u>Part C</u>	<u>Part D/range</u>	<u>Part E</u>	<u>Part F</u>
<u>Current Conditions</u>					
<u>DCR2015BASE</u>	<u>Millerton</u>	<u>Rel-Outlet Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>DCR2015BASE</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>DCR2015TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Outlet Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>DCR2015TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>2030 Conditions</u>					
<u>CWC2030BASE</u>	<u>Millerton</u>	<u>Rel-Outlet Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2030BASE</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2030TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Outlet Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2030TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>2070 Conditions</u>					
<u>CWC2070BASE</u>	<u>Millerton</u>	<u>Rel-Outlet Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2070BASE</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2070TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Outlet Total</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>
<u>CWC2070TEMPFLATV4</u>	<u>Millerton</u>	<u>Rel-Spill</u>	<u>1JAN1921-01JAN2003</u>	<u>1DAY</u>	<u>DailyModel</u>

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<u>Part A</u>	<u>Part B</u>	<u>Part C</u>	<u>Part D/range</u>	<u>Part E</u>	<u>Part F</u>
<u>Note:</u> <u>Part A:</u> BASE indicates the without-project condition for each simulation TEMPFLATV4 indicates the with-project condition for each simulation <u>Part B:</u> Rel-Outlet Total indicates the total outlet release out of Friant Dam (Millerton) Rel-Spill indicates the spills out of Friant Dam (Millerton)					

### Data Discussion:

Daily Model is an Excel-based daily operation model to disaggregate monthly water operations into a daily set of water operations for use in further analyses. The without-project operations reads monthly CalSim II water operations whereas the with-project operations reads monthly GamingTool water operations. For flow exceedence analysis, the sum of total release from Friant Dam and spills from Friant Dam is compared between the without-project and with-project condition. For more details on CalSim II, GamingTool and Daily Model outputs see the above model reference.

### Monthly Average Flow process:

1. The daily Rel-Outlet Total and Rel-Spill values are summed for the without-project and with-project condition to get the total daily flow release from Friant.
2. The total daily flow release from Friant for without-project and with-project condition are averaged get monthly total release from Friant.
3. Take the average of the monthly total releases from Friant Dam by Restoration water year type (wet, normal-wet, normal-dry, dry, critical-low, and critical-high).
4. Plot the average monthly total release by water year type.
5. Calculate the percentage change from the with-project to the without-project condition for each month. A negative percent change means that the with-project condition has lower average monthly Friant releases. A positive percent change means that the with-project condition has higher average monthly Friant releases.
6. This process is repeated for current, 2030, and 2070 conditions.

### Exhibits 17, 18, and 19: Monthly Release Pattern – Current, 2030, and 2070 Conditions

Model Source: Gaming Tool

Model Reference: BCMR REVISED A5: Modeling Approach, Chapter 3 Operations Modeling, Page 3-1.

### Data Summary:

<u>Gaming Tool Excel Files</u>			
<u>Condition</u>	<u>Spreadsheet*</u>	<u>Tab/Column</u>	<u>Data**</u>

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Current	GamingTool_DCR2015TempFlatV4	DailyModelInput/Column I	CalSim/C18M/Flow/Main		
2030	GamingTool_CWC2030TempFlatV4				
2070	GamingTool_CWC2070TempFlatV4				
*TempFlatV4 indicates the with-project condition.					
**This is the SJRRP Restoration Flow Requirement. These values are the same in the three GamingTool spreadsheets.					
GamingTool DSS File					
Part A	Part B	Part C	Part D/range	Part E	Part F
Current Conditions					
DCR2015TEMPFLATV4	Refuge	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
DCR2015TEMPFLATV4	Westside Inflow	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
DCR2015TEMPFLATV4	Westside Exchange	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
DCR2015TEMPFLATV4	Westside Exchange	Spill	01Oct1921-30Sep2003	1MON	GamingTool
2030 Conditions					
CWC2030TEMPFLATV4	Refuge	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
CWC2030TEMPFLATV4	Westside Inflow	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
CWC2030TEMPFLATV4	Westside Exchange	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
CWC2030TEMPFLATV4	Westside Exchange	Spill	01Oct1921-30Sep2003	1MON	GamingTool
2070 Conditions					
CWC2070TEMPFLATV4	Refuge	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
CWC2070TEMPFLATV4	Westside Inflow	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
CWC2070TEMPFLATV4	Westside Exchange	Delivery	01Oct1921-30Sep2003	1MON	GamingTool
CWC2070TEMPFLATV4	Westside Exchange	Spill	01Oct1921-30Sep2003	1MON	GamingTool
Note: Part A: TEMPFLATV4 indicates the with-project condition for each simulation					

### Data Discussion:

#### Gaming Tool Excel Files

This data is the SJRRP Restoration flows, these values came from CalSim and are the same for the current, 2030 and 2070 condition. This is labeled as Restoration in the Exhibits.

#### GamingTool DSS File

Refuge delivery is the incremental level 4 refuge delivery computed for current, 2030 and 2070 with-project conditions in the Gaming Tool. This is labeled as Incremental Level 4 Refuge Flow.

Westside Inflow delivery is the account delivery computed for current, 2030 and 2070 with-project conditions in the Gaming Tool.

Westside Exchange delivery is the account delivery computed for current, 2030 and 2070 with-project conditions in the Gaming Tool.

The sum of Westside Inflow delivery and Westside Exchange delivery is labeled as Delivery in the Exhibits.

Westside Exchange spill is the spill from the account computed for current, 2030 and 2070 with-project conditions in the Gaming Tool. This is labeled as Flood Release in the Exhibits.

**Exhibits 21, 22, and 23: Floodplain Activation Flow – Current, 2030, and 2070 Conditions**  
Model Source: River Temperature Model (SJR5Q)



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Model Reference: *BCMR REVISED A5: Modeling Approach, Chapter 4 Temperature Modeling, Page 4-1.*

### Data Summary:

Part A	Part B	Part C	Part D/range	Part E	Part F
<b>Current Conditions</b>					
DCR2015BASE	REACH01 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH02 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH03 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH04 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH05 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH06 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH09 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH10 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH11 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH12 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH13 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH14 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH15 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH16 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH17 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015BASE	REACH18 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH01 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH02 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH03 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH04 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH05 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH06 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH09 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH10 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH11 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH12 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH13 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH14 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH15 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH16 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH17 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
DCR2015TEMPFLATV4	REACH18 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
<b>2030 Conditions</b>					
CWC2030BASE	REACH01 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH02 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH03 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH04 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH05 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH06 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH09 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH10 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH11 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH12 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH13 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH14 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH15 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH16 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH17 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030BASE	REACH18 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP

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Part A	Part B	Part C	Part D/range	Part E	Part F
CWC2030TEMPFLATV4	REACH01 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH02 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH03 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH04 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH05 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH06 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH09 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH10 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH11 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH12 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH13 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH14 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH15 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH16 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH17 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2030TEMPFLATV4	REACH18 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
2070 Conditions					
CWC2070BASE	REACH01 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH02 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH03 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH04 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH05 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH06 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH09 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH10 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH11 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH12 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH13 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH14 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH15 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH16 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH17 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070BASE	REACH18 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH01 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH02 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH03 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH04 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH05 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH06 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH09 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH10 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH11 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH12 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH13 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH14 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH15 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH16 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH17 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
CWC2070TEMPFLATV4	REACH18 U	FLOW	01JAN1980-01JAN2003	1DAY	RIVTEMP
Note:					
Part A:					
BASE indicates the without-project condition for each simulation					
TEMPFLATV4 indicate the with-project condition for each simulation					
Part B:					
ReachXX U represents the upstream reach condition from the SJR5Q model					

Data Discussion:

SJR5Q outputs river temperature data in 6-hour flow increments for each reach location. For temperature threshold analysis, the 6-hour flow is summarized into daily average flows. Each reach has an upstream and downstream location, for this analysis the upstream reach location, denoted as ReachXX\_U in the above data summary table, is used for floodplain activation flow analysis. For more details on the SJR5Q model and data output see the above model reference.

Floodplain Activation Flow analysis process

1. For each reach location, select the mid-March through mid-May data for each year (1980-2003).
2. Take the 7-day moving minimum value from the mid-March through mid-May data for each year from Step 1.
3. Take the maximum value of the 7-day moving minimums for each year from Step 2.
4. Rank the maximum 7-day moving minimums from Step 3 from highest to lowest value. Sort the data by all years and Restoration year type (wet, normal-wet, normal-dry and dry).
5. Select the Floodplain Activation Flow for all year and by water year type. The Floodplain Activation Flow is taken as the flow that will occur 2 out of 3 years (i.e. flows with a 67% frequency of occurrence).
6. Repeat steps 1 through 5 for the with-project condition.
7. Tabulate the Floodplain Activation flows computed for without-project and with-project condition by all years and water year types. The percent change is change from the without-project condition to the with-project condition. A positive percent change indicates that the Floodplain Activation Flow has increased in the with-project condition relative to the without-project condition for that reach. A negative percent change indicates that the Floodplain Activation Flow has decreased in the with-project condition relative to the without-project condition for that reach.
8. Repeat Steps 1 through 7 for current, 2030 and 2070 conditions.

**Exhibit 24: Floodplain Activation Analysis Procedure**

This figure outlines the process analysis for determining the Floodplain Activation Flow (FAF). This was used to develop Exhibits 21, 22, and 23: Floodplain Activation Flow – Current, 2030 and 2070 Condition

Background: "Floodplain activation flow" (FAF) is defined as "the smallest flood pulse that initiates substantial beneficial ecological processes when associated with floodplain inundation" by Williams et al. (2009) ("Quantifying Activated Floodplains on a Lowland regulated River: Its Application to Floodplain Restoration in the Sacramento Valley"). The authors of this paper define this for the Sacramento River as the river stage that is exceeded in 2 out of 3 years for 7 days in mid-March to mid-May.

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### Part A) Typical Daily Stage Hydrograph

Step 1: Flow data (1980-2003) is called from the most upstream point of each of reach of interest and used as a representative flow for the reach. The flow data for each reach is an output from the River Temperature Model.

### Part B) Selection of Activation Flow for a Particular Year

Step 2: Flow during the spring flow period (March 15 – May 15) for each year of record is selected.

Step 3: Running 7-day minimums are calculated for the spring flow period for each year starting on March 21, the seventh day in this period.

Step 4: The maximum of these running minimums for each year of record is selected and called 7-day minimum maximums.

### Part C) Selection of Floodplain Activation Flow from Period of Record

Step 5: The yearly maximums are ranked by magnitude, highest to lowest. Since the FAF is defined as "stage (or flow, the author states) that is exceeded in 2 out of 3 years" and the 24 year record is ranked, the 16<sup>th</sup> highest flow (or 8<sup>th</sup> lowest flow) is selected as the FAF.

Step 6: The resulting FAF for each reach is compared to other operational conditions.

## EXHIBIT 1 LIFE HISTORY TABLE

**Table 1-1.** Temporal Occurrence of Each Life Stage of Fall-Run and Spring-Run Chinook Salmon in the San Joaquin River and Major Tributaries (Merced, Tuolumne, and Stanislaus Rivers)

Major tributaries (Merced, Tuolumne, and Stanislaus Rivers)													
Life Stage	Threshold <sup>1</sup>	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chinook Salmon (Fall-Run)													
Adult migration	18°C												
Spawning	13°C												
Incubation and emergence	13°C												
Juvenile/fry rearing	16°C												
Juvenile migration	18°C												
Chinook Salmon (Spring-Run)													
Adult migration	18°C												
Spawning	13°C												
Incubation and emergence	13°C												
Juvenile/fry rearing	16°C												
Juvenile migration	18°C												

Source: Sources:

SJRRP 2012, J. Hannon, pers com. (for fall-run Chinook salmon)

SJRRP March 2014, Technical Report: Analysis of Fish Benefits of Reach 2B Alternatives of the San Joaquin River (for spring-run Chinook salmon)

Note:

The timing for spring-run Chinook salmon adult migration begins February 20

Key:

	No presence
	Some presence
	Peak presence

<sup>1</sup>Threshold criteria set by the EPA

## Temperance Flat Reservoir Project

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## EXHIBIT 2 TEMPERATURE THRESHOLD ANALYSIS - CURRENT CONDITIONS

Note: A decrease in the number of days above the threshold for the with-project condition compared to the without-project is considered a temperature improvement.

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**Table 2-1.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – All Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions - All Year Types															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Mar- mid July (Total 3,288)		mid-Aug - Oct (Total 1,793)		mid-Aug - Mar (Total 5,356)		Jan - Dec (Total 8,668)		Jan - May (Total 3,619)					
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	675	28	1770	74	27	1	0	0				
	With-Project	0	0	296	12	1212	51	0	0	0	0				
	% Change	0.0%		-21.1%		-10.4%		-0.3%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	1235	51	1793	75	3112	130	4297	179	441	18				
	With-Project	1119	47	1793	75	4110	171	4267	178	355	15				
	% Change	-3.5%		0.0%		18.6%		-0.3%		-2.4%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	1352	56					4637	193	525	22				
	With-Project	1580	66					5188	216	722	30				
	% Change	6.9%						6.4%		5.4%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1583	66												
	With-Project	1996	83												
	% Change	12.6%													
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	1809	75												
	With-Project	2150	90												
	% Change	10.4%													
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	1989	83												
	With-Project	2361	98												
	% Change	11.3%													
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	2641	110												
	With-Project	2721	113												
	% Change	2.4%													

Notes:

1.) % Change calculated as the percent difference from Without-Project to With-Project

2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions - All Year Types																									
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration															
Threshold		18° C		13° C		13° C		16° C		18° C															
Total Days In Period		Feb 20 -mid Jun (Total 2,790)		Sep-Nov (Total 2,123)		Sep-Jan (Total 3,574)		Jan - Dec (Total 8,668)		Feb - Jun (Total 3,606)															
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count														
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	1320	55	1725	72	27	1	0	0														
	With-Project	0	0	616	26	1212	51	0	0	0	0														
	% Change	0.0%		-33.2%		-14.4%		-0.3%		0.0%															
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	681	28	2123	88	2587	108	4297	179	933	39														
	With-Project	558	23	2096	87	2619	109	4267	178	798	33														
	% Change	-4.4%		-1.3%		0.9%		-0.3%		-3.7%															
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	776	32					4637	193	1043	43														
	With-Project	980	41					5188	216	1255	52														
	% Change	7.3%						6.4%		5.9%															
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	955	40									1261	53												
	With-Project	1313	55									1651	69												
	% Change	12.8%										10.8%													
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	1125	47													1456	61								
	With-Project	1437	60													1791	75								
	% Change	11.2%														9.3%									
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	1274	53																	1632	68				
	With-Project	1642	68																	2002	83				
	% Change	13.2%																		10.3%					
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	1931	80																					2291	95
	With-Project	2004	84																					2364	99
	% Change	2.6%																						2.0%	

Notes:  
1.) % Change calculated as the percent difference from Without-Project to With-Project  
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)



## Temperance Flat Reservoir Project

**Table 2-2.** Count and Percent of Exceedence of the 7DADM Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Dry Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Dry Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July		mid-Aug - Oct		mid-Aug - Mar		Jan - Dec		Jan - May	
		Total (685)		Total (380)		Total (1137)		Total (1827)		Total (757)	
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	113	5	336	14	8	0	0	0
	With-Project	0	0	0	0	96	4	0	0	0	0
	% Change	0.0%		-29.7%		-21.1%		-0.4%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	419	17	380	16	669	28	1106	46	194	8
	With-Project	371	15	380	16	811	34	1037	43	163	7
	% Change	-7.0%		0.0%		12.5%		-3.8%		-4.1%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	464	19					1149	48	239	10
	With-Project	457	19					1134	47	232	10
	% Change	-1.0%						-0.8%		-0.9%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	509	21							284	12
	With-Project	512	21							287	12
	% Change	0.4%								0.4%	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	512	21							287	12
	With-Project	527	22							302	13
	% Change	2.2%								2.0%	
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	532	22							307	13
	With-Project	549	23							324	14
	% Change	2.5%								2.2%	
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	607	25							382	16
	With-Project	612	26							387	16
	% Change	0.7%								0.7%	
Notes:											
1.) % Change calculated as the percent difference from Without-Project to With-Project											
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (582)		Sep - Nov Total (455)		Sep - Jan Total (765)		Jan - Dec Total (1827)		Feb - Jun Total (752)					
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	263	11	336	14	8	0	0	0				
	With-Project	0	0	28	1	96	4	0	0	0	0				
	% Change	0.0%		-51.6%		-31.4%		-0.4%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	269	11	455	19	539	22	1106	46	344	14				
	With-Project	221	9	443	18	493	21	1037	43	296	12				
	% Change	-8.2%		-2.6%		-6.0%		-3.8%		-6.4%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	314	13					1149	48	389	16				
	With-Project	307	13					1134	47	382	16				
	% Change	-1.2%						-0.8%		-0.9%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	359	15					434	18						
	With-Project	362	15					437	18						
	% Change	0.5%						0.4%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	362	15					437	18						
	With-Project	377	16					452	19						
	% Change	2.6%						2.0%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	382	16					457	19						
	With-Project	399	17					474	20						
	% Change	2.9%						2.3%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	457	19					532	22						
	With-Project	462	19					537	22						
	% Change	0.9%						0.7%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 2-3.** Count and Percent of Exceedence of the 7DADM Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Normal-Dry Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Normal-Dry Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July		mid-Aug - Oct		mid-Aug - Mar		Jan - Dec		Jan - May	
		Total (822)		Total (456)		Total (1362)		Total (2190)		Total (906)	
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	192	8	474	20	15	1	0	0
	With-Project	0	0	29	1	260	11	0	0	0	0
	% Change	0.0%		-35.7%		-15.7%		-0.7%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	414	17	456	19	817	34	1222	51	144	6
	With-Project	344	14	456	19	1034	43	1132	47	80	3
	% Change	-8.5%		0.0%		15.9%		-4.1%		-7.1%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	431	18					1269	53	161	7
	With-Project	418	17					1305	54	148	6
	% Change	-1.6%						1.6%		-1.4%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	482	20								
	With-Project	533	22								
	% Change	6.2%						5.6%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	587	24								
	With-Project	607	25								
	% Change	2.4%						2.2%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	607	25								
	With-Project	621	26								
	% Change	1.7%						1.5%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	686	29								
	With-Project	695	29								
	% Change	1.1%						0.2%			
Notes:											
1.) % Change calculated as the percent difference from Without-Project to With-Project											
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Normal-Dry Water Year Type																															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration																					
Threshold		18° C		13° C		13° C		16° C		18° C																					
Total Days In Period		Feb 20 - Mid June Total (696)		Sep - Nov Total (546)		Sep - Jan Total (918)		Jan - Dec Total (2190)		Feb - Jun Total (900)																					
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count																				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	372	16	474	20	15	1	0	0																				
	With-Project	0	0	85	4	260	11	0	0	0	0																				
	% Change	0.0%		-52.6%		-23.3%		-0.7%		0.0%																					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	234	10	546	23	661	28	1222	51	324	14																				
	With-Project	164	7	537	22	654	27	1132	47	254	11																				
	% Change	-10.1%		-1.6%		-0.8%		-4.1%		-7.8%																					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	251	10					1269	53	341	14																				
	With-Project	238	10					1305	54	328	14																				
	% Change	-1.9%						1.6%		-1.4%																					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	302	13									392	16																		
	With-Project	353	15									443	18																		
	% Change	7.3%										5.7%																			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	407	17													497	21														
	With-Project	427	18													517	22														
	% Change	2.9%														2.2%															
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	427	18																	517	22										
	With-Project	441	18																	531	22										
	% Change	2.0%																		1.6%											
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	516	22																					606	25						
	With-Project	518	22																					608	25						
	% Change	0.3%																						0.2%							
Notes:																															
1.) % Change calculated as the percent difference from Without-Project to With-Project																															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																															

## Temperance Flat Reservoir Project

**Table 2-4.** Count and Percent of Exceedence of the 7DADM Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Normal-Wet Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Normal-Wet Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July Total (685)		mid-Aug - Oct Total (349)		mid-Aug - Mar Total (1046)		Jan - Dec Total (1736)		Jan - May Total (758)	
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	114	5	307	13	4	0	0	0
	With-Project	0	0	115	5	349	15	0	0	0	0
	% Change	0.0%		0.3%		4.0%		-0.2%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	328	14	349	15	605	25	915	38	103	4
	With-Project	294	12	349	15	920	38	907	38	83	3
	% Change	-5.0%		0.0%		30.1%		-0.5%		-2.6%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	346	14					950	40	121	5
	With-Project	356	15					996	42	131	5
	% Change	1.5%						2.6%		1.3%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	358	15							133	6
	With-Project	407	17							182	8
	% Change	7.2%								6.5%	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	364	15							139	6
	With-Project	409	17							184	8
	% Change	6.6%								5.9%	
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	395	16							170	7
	With-Project	473	20							248	10
	% Change	11.4%								10.3%	
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	589	25							364	15
	With-Project	598	25							373	16
	% Change	1.3%								1.2%	
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Normal-Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (583)		Sep - Nov Total (394)		Sep - Jan Total (673)		Jan - Dec Total (1736)		Feb - Jun Total (753)					
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	234	10	307	13	4	0	0	0				
	With-Project	0	0	193	8	349	15	0	0	0	0				
	% Change	0.0%		-10.4%		6.2%		-0.2%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	178	7	394	16	494	21	915	38	253	11				
	With-Project	144	6	390	16	560	23	907	38	219	9				
	% Change	-5.8%		-1.0%		9.8%		-0.5%		-4.5%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	196	8					950	40	271	11				
	With-Project	206	9					996	42	281	12				
	% Change	1.7%						2.6%		1.3%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	208	9					283	12						
	With-Project	257	11					332	14						
	% Change	8.4%						6.5%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	214	9					289	12						
	With-Project	259	11					334	14						
	% Change	7.7%						6.0%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	245	10					320	13						
	With-Project	323	13					398	17						
	% Change	13.4%						10.4%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	439	18					514	21						
	With-Project	448	19					523	22						
	% Change	1.5%						1.2%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 2-5.** Count and Percent of Exceedence of the 7DADM Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Wet Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Wet Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July Total (1096)		mid-Aug - Oct Total (608)		mid-Aug - Mar Total (1811)		Jan - Dec Total (2915)		Jan - May Total (1203)	
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	256	11	653	27	0	0	0	0
	With-Project	0	0	152	6	507	21	0	0	0	0
	% Change	0.0%		-17.1%		-8.1%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	74	3	608	25	1021	43	1054	44	0	0
	With-Project	110	5	608	25	1345	56	1191	50	29	1
	% Change	3.3%		0.0%		17.9%		4.7%		2.4%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	111	5					1269	53	4	0
	With-Project	349	15					1753	73	211	9
	% Change	21.7%						16.6%		17.2%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	234	10							38	2
	With-Project	544	23							253	11
	% Change	28.3%								17.9%	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	346	14							70	3
	With-Project	607	25							256	11
	% Change	23.8%								15.5%	
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	455	19							123	5
	With-Project	718	30							359	15
	% Change	24.0%								19.6%	
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	759	32							399	17
	With-Project	816	34							456	19
	% Change	5.2%								4.7%	
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (929)		Sep - Nov Total (728)		Sep - Jan Total (1218)		Jan - Dec Total (2915)		Feb - Jun Total (1201)					
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	451	19	608	25	0	0	0	0				
	With-Project	0	0	310	13	507	21	0	0	0	0				
	% Change	0.0%		-19.4%		-8.3%		0.0%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	0	0	728	30	893	37	1054	44	12	1				
	With-Project	29	1	726	30	912	38	1191	50	29	1				
	% Change	3.1%		-0.3%		1.6%		4.7%		1.4%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	15	1					1269	53	42	2				
	With-Project	229	10					1753	73	264	11				
	% Change	23.0%						16.6%		18.5%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	86	4					152	6						
	With-Project	341	14					439	18						
	% Change	27.4%						23.9%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	142	6					233	10						
	With-Project	374	16					488	20						
	% Change	25.0%						21.2%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	220	9					338	14						
	With-Project	479	20					599	25						
	% Change	27.9%						21.7%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	519	22					639	27						
	With-Project	576	24					696	29						
	% Change	6.1%						4.7%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															



## Temperance Flat Reservoir Project

**Table 2-6.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – All Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis Current Conditions - All Year Types														
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration				
Threshold		18° C		13° C		13° C		16° C		18° C				
Total Days In Period		Sep - Nov (Total 2,123)		Oct - Dec (Total 2,116)		Oct - Mar (Total 4,276)		Jan - May (Total 3,624)		Jan - May (Total 3,624)				
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count			
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	1609	67	1609	67	0	0	0	0			
	With-Project	0	0	1008	42	1115	46	0	0	0	0			
	% Change	0.0%		-28.4%		-11.6%		0.0%		0.0%				
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	1350	56	1808	75	2032	85	549	23	441	18			
	With-Project	1220	51	1714	71	3030	126	659	27	355	15			
	% Change	-6.1%		-4.4%		23.3%		3.0%		-2.4%				
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	1526	64					669	28	525	22			
	With-Project	1503	63					1280	53	722	30			
	% Change	-1.1%						16.9%		5.4%				
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1645	69											
	With-Project	1619	67											
	% Change	-1.2%								8.8%				
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	1432	60											
	With-Project	1456	61											
	% Change	1.1%								7.3%				
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	1490	62											
	With-Project	1523	63											
	% Change	1.6%								9.5%				
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	1556	65											
	With-Project	1563	65											
	% Change	0.3%								2.0%				

Notes:

- 1.) % Change calculated as the percent difference from Without-Project to With-Project
- 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)

## Temperance Flat Reservoir Project

**Table 2-7.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Dry Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Sep - Nov Total (455)		Oct - Dec Total (460)		Oct - Mar Total (912)		Jan - May Total (757)		Jan - May Total (757)					
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	336	14	336	14	0	0	0	0				
	With-Project	0	0	84	4	96	4	0	0	0	0				
	% Change	0.0%		-54.8%		-26.3%		0.0%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	306	13	378	16	444	19	246	10	194	8				
	With-Project	244	10	318	13	586	24	247	10	163	7				
	% Change	-13.6%		-13.0%		15.6%		0.1%		-4.1%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	342	14					282	12	239	10				
	With-Project	321	13					309	13	232	10				
	% Change	-4.6%						3.6%		-0.9%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	358	15					284	12						
	With-Project	344	14					287	12						
	% Change	-3.1%						0.4%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	320	13					287	12						
	With-Project	318	13					302	13						
	% Change	-0.4%						2.0%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	332	14					307	13						
	With-Project	333	14					324	14						
	% Change	0.2%						2.2%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	340	14					382	16						
	With-Project	340	14					387	16						
	% Change	0.0%						0.7%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 2-8.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Normal-Dry Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Normal-Dry Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Sep - Nov Total (546)		Oct - Dec Total (552)		Oct - Mar Total (1092)		Jan - May Total (906)		Jan - May Total (906)	
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	457	19	457	19	0	0	0	0
	With-Project	0	0	231	10	260	11	0	0	0	0
	% Change	0.0%		-40.9%		-18.0%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	342	14	468	20	547	23	165	7	144	6
	With-Project	301	13	435	18	764	32	173	7	80	3
	% Change	-7.5%		-6.0%		19.9%		0.9%		-7.1%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	401	17					204	9	161	7
	With-Project	377	16					311	13	148	6
	% Change	-4.4%						11.8%		-1.4%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	433	18								
	With-Project	416	17								
	% Change	-3.1%						5.6%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	368	15								
	With-Project	362	15								
	% Change	-1.1%						2.2%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	384	16								
	With-Project	383	16								
	% Change	-0.2%						1.5%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	393	16								
	With-Project	393	16								
	% Change	0.0%						0.2%			

Notes:

1.) % Change calculated as the percent difference from Without-Project to With-Project

2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)

## Temperance Flat Reservoir Project

**Table 2-9.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Normal-Wet Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Normal-Wet Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Sep - Nov Total (394)		Oct - Dec Total (368)		Oct - Mar Total (821)		Jan - May Total (758)		Jan - May Total (758)	
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	298	12	298	12	0	0	0	0
	With-Project	0	0	238	10	296	12	0	0	0	0
	% Change	0.0%		-16.3%		-0.2%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	257	11	317	13	380	16	126	5	103	4
	With-Project	246	10	328	14	695	29	153	6	83	3
	% Change	-2.8%		3.0%		38.4%		3.6%		-2.6%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	282	12					138	6	121	5
	With-Project	276	12					215	9	131	5
	% Change	-1.5%						10.2%		1.3%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	301	13					133	6		
	With-Project	296	12					182	8		
	% Change	-1.3%						6.5%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	268	11					139	6		
	With-Project	266	11					184	8		
	% Change	-0.5%						5.9%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	275	11					170	7		
	With-Project	275	11					248	10		
	% Change	0.0%						10.3%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	283	12					364	15		
	With-Project	282	12					373	16		
	% Change	-0.3%						1.2%			
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

**Table 2-10.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project Current Conditions – Wet Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis Current Conditions- Wet Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Sep - Nov Total (728)		Oct - Dec Total (736)		Oct - Mar Total (1451)		Jan - May Total (1203)		Jan - May Total (1203)	
Current		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	518	22	518	22	0	0	0	0
	With-Project	0	0	455	19	463	19	0	0	0	0
	% Change	0.0%		-8.6%		-3.8%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	445	19	645	27	661	28	12	1	0	0
	With-Project	429	18	633	26	985	41	86	4	29	1
	% Change	-2.2%		-1.6%		22.3%		6.2%		2.4%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	501	21					45	2	4	0
	With-Project	529	22					445	19	211	9
	% Change	3.8%						33.3%		17.2%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	553	23					38		2	
	With-Project	563	23					253		11	
	% Change	1.4%						17.9%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	476	20					70		3	
	With-Project	510	21					256		11	
	% Change	4.7%						15.5%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	499	21					123		5	
	With-Project	532	22					359		15	
	% Change	4.5%						19.6%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	540	23					399		17	
	With-Project	548	23					456		19	
	% Change	1.1%						4.7%			



## EXHIBIT 3 TEMPERATURE THRESHOLD ANALYSIS - 2030 CONDITIONS

**Note:** A decrease in the number of days above the threshold for the with-project condition compared to the without-project is considered a temperature improvement.

**Table 3-1.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – All Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions - All Year Types															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Mar- mid July (Total 3,288)		mid-Aug - Oct (Total 1,793)		mid-Aug - Mar (Total 5,356)		Jan - Dec (Total 8,668)		Jan - May (Total 3,619)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	564	24	1604	67	47	2	0	0				
	With-Project	0	0	74	3	638	27	0	0	0	0				
	% Change	0.0%		-27.3%		-18.0%		-0.5%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	630	26	1793	75	3247	135	4273	178	39	2				
	With-Project	1058	44	1793	75	4075	170	4192	175	275	11				
	% Change	13.0%		0.0%		15.5%		-0.9%		6.5%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	1195	50					4814	201	299	12				
	With-Project	1365	57					5033	210	531	22				
	% Change	5.2%						2.5%		6.4%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1800	75												
	With-Project	1840	77												
	% Change	1.2%													
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	2090	87												
	With-Project	2048	85												
	% Change	-1.3%													
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	2292	96												
	With-Project	2309	96												
	% Change	0.5%													
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	2852	119												
	With-Project	2873	120												
	% Change	0.6%													

Notes:

- 1.) % Change calculated as the percent difference from Without-Project to With-Project
- 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions - All Year Types															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid Jun (Total 2,790)		Sep-Nov (Total 2,123)		Sep-Jan (Total 3,574)		Jan - Dec (Total 8,668)		Feb - Jun (Total 3,606)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	1203	50	1574	66	47	2	0	0				
	With-Project	0	0	263	11	638	27	0	0	0	0				
	% Change	0.0%		-44.3%		-26.2%		-0.5%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	134	6	2123	88	2593	108	4273	178	314	13				
	With-Project	492	21	2081	87	2644	110	4192	175	732	31				
	% Change	12.8%		-2.0%		1.4%		-0.9%		11.6%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	537	22					4814	201	857	36				
	With-Project	766	32					5033	210	1033	43				
	% Change	8.2%						2.5%		4.9%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1104	46							1449		60			
	With-Project	1168	49							1503		63			
	% Change	2.3%								1.5%					
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	1378	57							1731		72			
	With-Project	1334	56							1688		70			
	% Change	-1.6%								-1.2%					
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	1579	66							1939		81			
	With-Project	1606	67							1966		82			
	% Change	1.0%								0.7%					
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	2170	90							2531		105			
	With-Project	2192	91							2553		106			
	% Change	0.8%								0.6%					
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															



## Temperance Flat Reservoir Project

**Table 3-2.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – Dry Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Dry Water Year Type													
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration			
Threshold		18° C		13° C		13° C		16° C		18° C			
Total Days In Period		Mar- mid July		mid-Aug - Oct		mid-Aug - Mar		Jan - Dec		Jan - May			
		Total (685)		Total (380)		Total (1137)		Total (1827)		Total (757)			
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count		
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	82	3	303	13	0	0	0	0		
	With-Project	0	0	0	0	100	4	0	0	0	0		
	% Change	0.0%		-21.6%		-17.9%		0.0%		0.0%			
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	222	9	380	16	734	31	1033	43	31	1		
	With-Project	341	14	380	16	822	34	1026	43	129	5		
	% Change	17.4%		0.0%		7.7%		-0.4%		12.9%			
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	391	16					1179	49	170	7		
	With-Project	441	18					1144	48	216	9		
	% Change	7.3%						-1.9%		6.1%			
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	565	24										
	With-Project	521	22										
	% Change	-6.4%											
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	575	24										
	With-Project	544	23										
	% Change	-4.5%						-4.1%					
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	601	25										
	With-Project	569	24										
	% Change	-4.7%						-4.2%					
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	660	28										
	With-Project	660	28										
	% Change	0.0%						0.0%					
Notes:													
1.) % Change calculated as the percent difference from Without-Project to With-Project													
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)													

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (582)		Sep - Nov Total (455)		Sep - Jan Total (765)		Jan - Dec Total (1827)		Feb - Jun Total (752)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	232	10	303	13	0	0	0	0				
	With-Project	0	0	38	2	100	4	0	0	0	0				
	% Change	0.0%		-42.6%		-26.5%		0.0%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	81	3	455	19	548	23	1033	43	147	6				
	With-Project	191	8	439	18	513	21	1026	43	266	11				
	% Change	18.9%		-3.5%		-4.6%		-0.4%		15.8%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	241	10					1179	49	316	13				
	With-Project	291	12					1144	48	366	15				
	% Change	8.6%						-1.9%		6.6%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	416	17					491	20						
	With-Project	375	16					450	19						
	% Change	-7.0%						-5.5%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	425	18					500	21						
	With-Project	394	16					469	20						
	% Change	-5.3%						-4.1%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	452	19					527	22						
	With-Project	420	18					495	21						
	% Change	-5.5%						-4.3%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	513	21					588	25						
	With-Project	513	21					588	25						
	% Change	0.0%						0.0%							
Notes:															
1.) % Change calculated as the percent difference from Without-Project to With-Project															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 3-3.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – Normal-Dry Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Normal-Dry Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July Total (822)		mid-Aug - Oct Total (456)		mid-Aug - Mar Total (1362)		Jan - Dec Total (2190)		Jan - May Total (906)	
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	139	6	419	17	19	1	0	0
	With-Project	0	0	22	1	180	8	0	0	0	0
	% Change	0.0%		-25.7%		-17.5%		-0.9%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	190	8	456	19	856	36	1158	48	8	0
	With-Project	355	15	456	19	1081	45	1152	48	85	4
	% Change	20.1%		0.0%		16.5%		-0.3%		8.5%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	353	15					1320	55	85	4
	With-Project	432	18					1355	56	162	7
	% Change	9.6%						1.6%		8.5%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	558	23							293	12
	With-Project	567	24							314	13
	% Change	1.1%								2.3%	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	632	26							362	15
	With-Project	628	26							358	15
	% Change	-0.5%								-0.4%	
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	673	28							409	17
	With-Project	667	28							406	17
	% Change	-0.7%								-0.3%	
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	751	31							510	21
	With-Project	751	31							510	21
	% Change	0.0%								0.0%	
Notes:											
1.) % Change calculated as the percent difference from Without-Project to With-Project											
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Normal-Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (696)		Sep - Nov Total (546)		Sep - Jan Total (918)		Jan - Dec Total (2190)		Feb - Jun Total (900)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	319	13	419	17	19	1	0	0				
	With-Project	0	0	52	2	180	8	0	0	0	0				
	% Change	0.0%		-48.9%		-26.0%		-0.9%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	36	2	546	23	673	28	1158	48	101	4				
	With-Project	175	7	536	22	683	28	1152	48	265	11				
	% Change	20.0%		-1.8%		1.1%		-0.3%		18.2%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	173	7					1320	55	263	11				
	With-Project	252	11					1355	56	342	14				
	% Change	11.4%						1.6%		8.8%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	383	16					473	20						
	With-Project	404	17					494	21						
	% Change	3.0%						2.3%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	452	19					542	23						
	With-Project	448	19					538	22						
	% Change	-0.6%						-0.4%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	499	21					589	25						
	With-Project	496	21					586	24						
	% Change	-0.4%						-0.3%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	599	25					690	29						
	With-Project	599	25					690	29						
	% Change	0.0%						0.0%							
Notes:															
1.) % Change calculated as the percent difference from Without-Project to With-Project															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 3-4.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – Normal-Wet Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Normal-Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Mar- mid July Total (685)		mid-Aug - Oct Total (349)		mid-Aug - Mar Total (1046)		Jan - Dec Total (1736)		Jan - May Total (758)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	109	5	294	12	5	0	0	0				
	With-Project	0	0	0	0	69	3	0	0	0	0				
	% Change	0.0%		-31.2%		-21.5%		-0.3%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	126	5	349	15	649	27	852	36	0	0				
	With-Project	255	11	349	15	904	38	858	36	40	2				
	% Change	18.8%		0.0%		24.4%		0.3%		5.3%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	246	10					932	39	33	1				
	With-Project	296	12					1026	43	73	3				
	% Change	7.3%						5.4%		5.3%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	333	14												
	With-Project	379	16												
	% Change	6.7%													
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	418	17					193	8						
	With-Project	419	17					194	8						
	% Change	0.1%						0.1%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	469	20					244	10						
	With-Project	502	21					277	12						
	% Change	4.8%						4.4%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	634	26					416	17						
	With-Project	636	27					419	17						
	% Change	0.3%						0.4%							
Notes:															
1.) % Change calculated as the percent difference from Without-Project to With-Project															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Normal-Wet Water Year Type																															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration																					
Threshold		18° C		13° C		13° C		16° C		18° C																					
Total Days In Period		Feb 20 - Mid June Total (583)		Sep - Nov Total (394)		Sep - Jan Total (673)		Jan - Dec Total (1736)		Feb - Jun Total (753)																					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count																				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	229	10	294	12	5	0	0	0																				
	With-Project	0	0	0	0	69	3	0	0	0	0																				
	% Change	0.0%		-58.1%		-33.4%		-0.3%		0.0%																					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	17	1	394	16	491	20	852	36	51	2																				
	With-Project	105	4	383	16	543	23	858	36	180	8																				
	% Change	15.1%		-2.8%		7.7%		0.3%		17.1%																					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	96	4					932	39	171	7																				
	With-Project	146	6					1026	43	221	9																				
	% Change	8.6%						5.4%		6.6%																					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	183	8											258	11																
	With-Project	229	10											304	13																
	% Change	7.9%												6.1%																	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	268	11															343	14												
	With-Project	269	11															344	14												
	% Change	0.2%																0.1%													
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	319	13																			394	16								
	With-Project	352	15																			427	18								
	% Change	5.7%																				4.4%									
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	491	20																							566	24				
	With-Project	494	21																							569	24				
	% Change	0.5%																								0.4%					
Notes:																															
1.) % Change calculated as the percent difference from Without-Project to With-Project																															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																															

## Temperance Flat Reservoir Project

**Table 3-5.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions - Wet Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Wet Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July Total (1096)		mid-Aug - Oct Total (608)		mid-Aug - Mar Total (1811)		Jan - Dec Total (2915)		Jan - May Total (1203)	
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	234	10	588	25	23	1	0	0
	With-Project	0	0	52	2	289	12	0	0	0	0
	% Change	0.0%		-29.9%		-16.5%		-0.8%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	92	4	608	25	1008	42	1230	51	0	0
	With-Project	107	4	608	25	1268	53	1156	48	21	1
	% Change	1.4%		0.0%		14.4%		-2.5%		1.7%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	205	9					1383	58	11	0
	With-Project	196	8					1508	63	80	3
	% Change	-0.8%						4.3%		5.7%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	344	14							36	2
	With-Project	373	16							96	4
	% Change	2.6%								5.0%	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	465	19							128	5
	With-Project	457	19							119	5
	% Change	-0.7%								-0.7%	
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	549	23							193	8
	With-Project	571	24							220	9
	% Change	2.0%								2.2%	
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	807	34							447	19
	With-Project	826	34							466	19
	% Change	1.7%								1.6%	
Notes:											
1.) % Change calculated as the percent difference from Without-Project to With-Project											
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Wet Water Year Type																															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration																					
Threshold		18° C		13° C		13° C		16° C		18° C																					
Total Days In Period		Feb 20 - Mid June Total (929)		Sep - Nov Total (728)		Sep - Jan Total (1218)		Jan - Dec Total (2915)		Feb - Jun Total (1201)																					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count																				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	423	18	558	23	23	1	0	0																				
	With-Project	0	0	173	7	289	12	0	0	0	0																				
	% Change	0.0%		-34.3%		-22.1%		-0.8%		0.0%																					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	0	0	728	30	881	37	1230	51	15	1																				
	With-Project	21	1	723	30	905	38	1156	48	21	1																				
	% Change	2.3%		-0.7%		2.0%		-2.5%		0.5%																					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	27	1					1383	58	107	4																				
	With-Project	77	3					1508	63	104	4																				
	% Change	5.4%						4.3%		-0.2%																					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	122	5									227	9																		
	With-Project	160	7									255	11																		
	% Change	4.1%										2.3%																			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	233	10													346	14														
	With-Project	223	9													337	14														
	% Change	-1.1%														-0.7%															
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	309	13																	429	18										
	With-Project	338	14																	458	19										
	% Change	3.1%																		2.4%											
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	567	24																					687	29						
	With-Project	586	24																					706	29						
	% Change	2.0%																						1.6%							
Notes:																															
1.) % Change calculated as the percent difference from Without-Project to With-Project																															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																															



## Temperance Flat Reservoir Project

**Table 3-6.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – All Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions - All Year Types											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Sep - Nov (Total 2,123)		Oct - Dec (Total 2,116)		Oct - Mar (Total 4,276)		Jan - May (Total 3,624)		Jan - May (Total 3,624)	
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	1508	63	1508	63	0	0	0	0
	With-Project	0	0	539	22	623	26	0	0	0	0
	% Change	0.0%		-45.8%		-20.7%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	1465	61	1774	74	2167	90	339	14	39	2
	With-Project	1259	52	1692	71	2995	125	581	24	275	11
	% Change	-9.7%		-3.9%		19.4%		6.7%		6.5%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	1622	68					704	29	299	12
	With-Project	1541	64					1120	47	531	22
	% Change	-3.8%						11.5%		6.4%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1718	72					780	33		
	With-Project	1668	70					864	36		
	% Change	-2.4%						2.3%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	1555	65					1033	43		
	With-Project	1558	65					990	41		
	% Change	0.1%						-1.2%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	1615	67					1223	51		
	With-Project	1616	67					1248	52		
	% Change	0.0%						0.7%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	1668	70					1811	75		
	With-Project	1668	70					1833	76		
	% Change	0.0%						0.6%			

Notes:  
1.) % Change calculated as the percent difference from Without-Project to With-Project  
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)

## Temperance Flat Reservoir Project

**Table 3-7.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – Dry Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Sep - Nov Total (455)		Oct - Dec Total (460)		Oct - Mar Total (912)		Jan - May Total (757)		Jan - May Total (757)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	303	13	303	13	0	0	0	0				
	With-Project	0	0	88	4	100	4	0	0	0	0				
	% Change	0.0%		-46.7%		-22.3%		0.0%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	330	14	376	16	509	21	176	7	31	1				
	With-Project	273	11	331	14	597	25	226	9	129	5				
	% Change	-12.5%		-9.8%		9.6%		6.6%		12.9%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	356	15					309	13	170	7				
	With-Project	335	14					301	13	216	9				
	% Change	-4.6%						-1.1%		6.1%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	372	16					341	14						
	With-Project	362	15					300	13						
	% Change	-2.2%						-5.4%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	348	15					350	15						
	With-Project	347	14					319	13						
	% Change	-0.2%						-4.1%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	356	15					377	16						
	With-Project	357	15					345	14						
	% Change	0.2%						-4.2%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	362	15					438	18						
	With-Project	362	15					438	18						
	% Change	0.0%						0.0%							
Notes:															
1.) % Change calculated as the percent difference from Without-Project to With-Project															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 3-8.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – Normal-Dry Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Normal-Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Sep - Nov Total (546)		Oct - Dec Total (552)		Oct - Mar Total (1092)		Jan - May Total (906)		Jan - May Total (906)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	417	17	417	17	0	0	0	0				
	With-Project	0	0	154	6	180	8	0	0	0	0				
	% Change	0.0%		-47.6%		-21.7%		0.0%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	379	16	466	19	586	24	103	4	8	0				
	With-Project	315	13	440	18	811	34	186	8	85	4				
	% Change	-11.7%		-4.7%		20.6%		9.2%		8.5%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	423	18					245	10	85	4				
	With-Project	394	16					345	14	162	7				
	% Change	-5.3%						11.0%		8.5%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	453	19					293	12						
	With-Project	431	18					314	13						
	% Change	-4.0%						2.3%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	414	17					362	15						
	With-Project	415	17					358	15						
	% Change	0.2%						-0.4%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	427	18					409	17						
	With-Project	426	18					406	17						
	% Change	-0.2%						-0.3%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	431	18					510	21						
	With-Project	431	18					510	21						
	% Change	0.0%						0.0%							
Notes:															
1.) % Change calculated as the percent difference from Without-Project to With-Project															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 3-9.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – Normal-Wet Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Normal-Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Sep - Nov Total (394)		Oct - Dec Total (368)		Oct - Mar Total (821)		Jan - May Total (758)		Jan - May Total (758)					
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	290	12	290	12	0	0	0	0				
	With-Project	0	0	26	1	69	3	0	0	0	0				
	% Change	0.0%		-71.7%		-26.9%		0.0%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	272	11	309	13	424	18	47	2	0	0				
	With-Project	252	11	312	13	679	28	102	4	40	2				
	% Change	-5.1%		0.8%		31.1%		7.3%		5.3%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	303	13					108	5	33	1				
	With-Project	287	12					228	10	73	3				
	% Change	-4.1%						15.8%		5.3%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	323	13					110	5						
	With-Project	308	13					154	6						
	% Change	-3.8%						5.8%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	282	12					193	8						
	With-Project	278	12					194	8						
	% Change	-1.0%						0.1%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	292	12					244	10						
	With-Project	291	12					277	12						
	% Change	-0.3%						4.4%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	294	12					416	17						
	With-Project	294	12					419	17						
	% Change	0.0%						0.4%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 3-10.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2030 Conditions – Wet Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2030 Conditions- Wet Water Year Type																											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration																	
Threshold		18° C		13° C		13° C		16° C		18° C																	
Total Days In Period		Sep - Nov Total (728)		Oct - Dec Total (736)		Oct - Mar Total (1451)		Jan - May Total (1203)		Jan - May Total (1203)																	
2030		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count																
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	498	21	498	21	0	0	0	0																
	With-Project	0	0	271	11	274	11	0	0	0	0																
	% Change	0.0%		-30.8%		-15.4%		0.0%		0.0%																	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	484	20	623	26	648	27	13	1	0	0																
	With-Project	419	17	609	25	908	38	67	3	21	1																
	% Change	-8.9%		-1.9%		17.9%		4.5%		1.7%																	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	540	23					42	2	11	0																
	With-Project	525	22					246	10	80	3																
	% Change	-2.1%						17.0%		5.7%																	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	570	24									36	2														
	With-Project	567	24									96	4														
	% Change	-0.4%										5.0%															
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	511	21													128	5										
	With-Project	518	22													119	5										
	% Change	1.0%														-0.7%											
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	540	23																	193	8						
	With-Project	542	23																	220	9						
	% Change	0.3%																		2.2%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	581	24																					447	19		
	With-Project	581	24																					466	19		
	% Change	0.0%																						1.6%			
Notes:																											
1.) % Change calculated as the percent difference from Without-Project to With-Project																											
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																											



## EXHIBIT 4 TEMPERATURE THRESHOLD ANALYSIS - 2070 CONDITIONS

Note: A decrease in the number of days above the threshold for the with-project condition compared to the without-project is considered a temperature improvement.

**Table 4-1.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – All Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions - All Year Types															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Mar- mid July (Total 3,288)		mid-Aug - Oct (Total 1,793)		mid-Aug - Mar (Total 5,356)		Jan - Dec (Total 8,668)		Jan - May (Total 3,619)					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	563	23	1648	69	174	7	0	0				
	With-Project	0	0	66	3	556	23	41	2	0	0				
	% Change	0.0%		-27.7%		-20.4%		-1.5%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	1358	57	1793	75	3447	144	4751	198	496	21				
	With-Project	1193	50	1793	75	4159	173	4420	184	389	16				
	% Change	-5.0%		0.0%		13.3%		-3.8%		-3.0%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	1575	66					5158	215	600	25				
	With-Project	1481	62					5296	221	581	24				
	% Change	-2.9%						1.6%		-0.5%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1914	80												
	With-Project	2068	86												
	% Change	4.7%										5.4%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	2163	90												
	With-Project	2251	94												
	% Change	2.7%										2.5%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	2391	100												
	With-Project	2544	106												
	% Change	4.7%										4.4%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	2977	124												
	With-Project	3053	127												
	% Change	2.3%										2.1%			

Notes:

1.) % Change calculated as the percent difference from Without-Project to With-Project

2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)

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## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions - All Year Types																	
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration							
Threshold		18° C		13° C		13° C		16° C		18° C							
Total Days In Period		Feb 20 -mid Jun (Total 2,790)		Sep-Nov (Total 2,123)		Sep-Jan (Total 3,574)		Jan - Dec (Total 8,668)		Feb - Jun (Total 3,606)							
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count						
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	1207	50	1628	68	174	7	0	0						
	With-Project	0	0	197	8	556	23	41	2	0	0						
	% Change	0.0%		-47.6%		-30.0%		-1.5%		0.0%							
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	740	31	2123	88	2770	115	4751	198	1004	42						
	With-Project	622	26	2098	87	2805	117	4420	184	862	36						
	% Change	-4.2%		-1.2%		1.0%		-3.8%		-3.9%							
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	880	37					5158	215	1218	51						
	With-Project	828	35					5296	221	1128	47						
	% Change	-1.9%						1.6%		-2.5%							
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1243	52									1589	66				
	With-Project	1421	59									1777		74			
	% Change	6.4%										5.2%					
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	1455	61											1815		76	
	With-Project	1549	65											1909		80	
	% Change	3.4%												2.6%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	1714	71											2075		86	
	With-Project	1871	78											2233		93	
	% Change	5.6%												4.4%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	2324	97											2699		112	
	With-Project	2401	100											2776		116	
	% Change	2.8%												2.1%			
Notes:																	
1.) % Change calculated as the percent difference from Without-Project to With-Project																	
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																	



## Temperance Flat Reservoir Project

**Table 4-2.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – Dry Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Dry Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July Total (685)		mid-Aug - Oct Total (380)		mid-Aug - Mar Total (1137)		Jan - Dec Total (1827)		Jan - May Total (757)	
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	120	5	351	15	0	0	0	0
	With-Project	0	0	0	0	70	3	0	0	0	0
	% Change	0.0%		-31.6%		-24.7%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	448	19	380	16	750	31	1156	48	223	9
	With-Project	419	17	380	16	926	39	1100	46	197	8
	% Change	-4.2%		0.0%		15.5%		-3.1%		-3.4%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	486	20					1206	50	261	11
	With-Project	476	20					1282	53	251	10
	% Change	-1.5%						4.2%		-1.3%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	528	22							310	13
	With-Project	581	24							372	16
	% Change	7.7%								8.2%	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	554	23							330	14
	With-Project	585	24							362	15
	% Change	4.5%								4.2%	
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	612	26							393	16
	With-Project	631	26							412	17
	% Change	2.8%								2.5%	
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	685	29							485	20
	With-Project	685	29							485	20
	% Change	0.0%								0.0%	
Notes:											
1.) % Change calculated as the percent difference from Without-Project to With-Project											
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Dry Water Year Type																															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration																					
Threshold		18° C		13° C		13° C		16° C		18° C																					
Total Days In Period		Feb 20 - Mid June Total (582)		Sep - Nov Total (455)		Sep - Jan Total (765)		Jan - Dec Total (1827)		Feb - Jun Total (752)																					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count																				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	270	11	351	15	0	0	0	0																				
	With-Project	0	0	7	0	70	3	0	0	0	0																				
	% Change	0.0%		-57.8%		-36.7%		0.0%		0.0%																					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	298	12	455	19	580	24	1156	48	373	16																				
	With-Project	269	11	443	18	560	23	1100	46	344	14																				
	% Change	-5.0%		-2.6%		-2.6%		-3.1%		-3.9%																					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	336	14					1206	50	411	17																				
	With-Project	326	14					1282	53	401	17																				
	% Change	-1.7%						4.2%		-1.3%																					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	385	16											460	19																
	With-Project	445	19											522	22																
	% Change	10.3%										8.2%																			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	405	17															480	20												
	With-Project	437	18															512	21												
	% Change	5.5%														4.3%															
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	468	20																			543	23								
	With-Project	487	20																			562	23								
	% Change	3.3%																		2.5%											
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	555	23																							635	26				
	With-Project	555	23																							635	26				
	% Change	0.0%																						0.0%							
Notes:																															
1.) % Change calculated as the percent difference from Without-Project to With-Project																															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																															

## Temperance Flat Reservoir Project

**Table 4-3.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – Normal-Dry Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Normal-Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Mar- mid July Total (822)		mid-Aug - Oct Total (456)		mid-Aug - Mar Total (1362)		Jan - Dec Total (2190)		Jan - May Total (906)					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	148	6	432	18	30	1	0	0				
	With-Project	0	0	8	0	174	7	0	0	0	0				
	% Change	0.0%		-30.7%		-18.9%		-1.4%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	425	18	456	19	920	38	1287	54	155	6				
	With-Project	385	16	456	19	1192	50	1265	53	115	5				
	% Change	-4.9%		0.0%		20.0%		-1.0%		-4.4%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	461	19					1399	58	191	8				
	With-Project	483	20					1511	63	215	9				
	% Change	2.7%						5.1%		2.6%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	591	25					348	15						
	With-Project	655	27					424	18						
	% Change	7.8%						8.4%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	655	27					396	17						
	With-Project	680	28					426	18						
	% Change	3.0%						3.3%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	693	29					452	19						
	With-Project	715	30					477	20						
	% Change	2.7%						2.8%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	792	33					565	24						
	With-Project	794	33					567	24						
	% Change	0.2%						0.2%							
Notes:															
1.) % Change calculated as the percent difference from Without-Project to With-Project															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Normal-Dry Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (696)		Sep - Nov Total (546)		Sep - Jan Total (918)		Jan - Dec Total (2190)		Feb - Jun Total (900)					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	328	14	432	18	30	1	0	0				
	With-Project	0	0	41	2	174	7	0	0	0	0				
	% Change	0.0%		-52.6%		-28.1%		-1.4%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	245	10	546	23	720	30	1287	54	335	14				
	With-Project	205	9	542	23	770	32	1265	53	295	12				
	% Change	-5.7%		-0.7%		5.4%		-1.0%		-4.4%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	281	12					1399	58	371	15				
	With-Project	305	13					1511	63	395	16				
	% Change	3.4%						5.1%		2.7%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	437	18					528	22						
	With-Project	508	21					604	25						
	% Change	10.2%						8.4%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	486	20					576	24						
	With-Project	516	22					606	25						
	% Change	4.3%						3.3%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	541	23					632	26						
	With-Project	566	24					657	27						
	% Change	3.6%						2.8%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	650	27					745	31						
	With-Project	652	27					747	31						
	% Change	0.3%						0.2%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 4-4.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – Normal-Wet Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Normal-Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Mar- mid July Total (685)		mid-Aug - Oct Total (349)		mid-Aug - Mar Total (1046)		Jan - Dec Total (1736)		Jan - May Total (758)					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	111	5	304	13	23	1	0	0				
	With-Project	0	0	0	0	128	5	0	0	0	0				
	% Change	0.0%		-31.8%		-16.8%		-1.3%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	343	14	349	15	707	29	972	41	118	5				
	With-Project	298	12	349	15	907	38	907	38	77	3				
	% Change	-6.6%		0.0%		19.1%		-3.7%		-5.4%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	355	15					1010	42	130	5				
	With-Project	336	14					1055	44	113	5				
	% Change	-2.8%						2.6%		-2.2%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	379	16					155	6						
	With-Project	418	17					206	9						
	% Change	5.7%						6.7%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	435	18					210	9						
	With-Project	465	19					240	10						
	% Change	4.4%						4.0%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	506	21					290	12						
	With-Project	557	23					343	14						
	% Change	7.4%						7.0%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	654	27					443	18						
	With-Project	655	27					445	19						
	% Change	0.1%						0.3%							
Notes:															
1.) % Change calculated as the percent difference from Without-Project to With-Project															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Normal-Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (583)		Sep - Nov Total (394)		Sep - Jan Total (673)		Jan - Dec Total (1736)		Feb - Jun Total (753)					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	231	10	304	13	23	1	0	0				
	With-Project	0	0	31	1	128	5	0	0	0	0				
	% Change	0.0%		-50.8%		-26.2%		-1.3%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	193	8	394	16	529	22	972	41	268	11				
	With-Project	148	6	390	16	580	24	907	38	223	9				
	% Change	-7.7%		-1.0%		7.6%		-3.7%		-6.0%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	205	9					1010	42	280	12				
	With-Project	186	8					1055	44	261	11				
	% Change	-3.3%						2.6%		-2.5%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	230	10					305	13						
	With-Project	278	12					356	15						
	% Change	8.2%						6.8%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	285	12					360	15						
	With-Project	315	13					390	16						
	% Change	5.1%						4.0%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	365	15					440	18						
	With-Project	417	17					493	21						
	% Change	8.9%						7.0%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	513	21					593	25						
	With-Project	515	21					595	25						
	% Change	0.3%						0.3%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 4-5.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Spring-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions - Wet Water Years

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Wet Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Mar- mid July Total (1096)		mid-Aug - Oct Total (608)		mid-Aug - Mar Total (1811)		Jan - Dec Total (2915)		Jan - May Total (1203)	
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	184	8	561	23	121	5	0	0
	With-Project	0	0	58	2	184	8	41	2	0	0
	% Change	0.0%		-20.7%		-20.8%		-2.7%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	142	6	608	25	1070	45	1336	56	0	0
	With-Project	91	4	608	25	1134	47	1148	48	0	0
	% Change	-4.7%		0.0%		3.5%		-6.4%		0.0%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	273	11					1543	64	18	1
	With-Project	186	8					1448	60	2	0
	% Change	-7.9%						-3.3%		-1.3%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	416	17							85	4
	With-Project	414	17							93	4
	% Change	-0.2%								0.7%	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	519	22							162	7
	With-Project	521	22							161	7
	% Change	0.2%								-0.1%	
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	580	24							220	9
	With-Project	641	27							281	12
	% Change	5.6%								5.1%	
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	846	35							486	20
	With-Project	919	38							559	23
	% Change	6.7%								6.1%	
Notes:											
1.) % Change calculated as the percent difference from Without-Project to With-Project											
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)											

## Temperance Flat Reservoir Project

Spring-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Feb 20 - Mid June Total (929)		Sep - Nov Total (728)		Sep - Jan Total (1218)		Jan - Dec Total (2915)		Feb - Jun Total (1201)					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	378	16	541	23	121	5	0	0				
	With-Project	0	0	118	5	184	8	41	2	0	0				
	% Change	0.0%		-35.7%		-29.3%		-2.7%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	4	0	728	30	941	39	1336	56	28	1				
	With-Project	0	0	723	30	895	37	1148	48	0	0				
	% Change	-0.4%		-0.7%		-3.8%		-6.4%		-2.3%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	58	2					1543	64	156	7				
	With-Project	11	0					1448	60	71	3				
	% Change	-5.1%						-3.3%		-7.1%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	191	8					296	12						
	With-Project	190	8					295	12						
	% Change	-0.1%						-0.1%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	279	12					399	17						
	With-Project	281	12					401	17						
	% Change	0.2%						0.2%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	340	14					460	19						
	With-Project	401	17					521	22						
	% Change	6.6%						5.1%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	606	25					726	30						
	With-Project	679	28					799	33						
	% Change	7.9%						6.1%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															



## Temperance Flat Reservoir Project

**Table 4-6.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – All Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions - All Year Types																													
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration																			
Threshold		18° C		13° C		13° C		16° C		18° C																			
Total Days In Period		Sep - Nov (Total 2,123)		Oct - Dec (Total 2,116)		Oct - Mar (Total 4,276)		Jan - May (Total 3,624)		Jan - May (Total 3,624)																			
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count																		
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	1557	65	1557	65	4	0	0	0																		
	With-Project	0	0	411	17	529	22	0	0	0	0																		
	% Change	0.0%		-54.2%		-24.0%		-0.1%		0.0%																			
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	1640	68	1824	76	2367	99	616	26	496	21																		
	With-Project	1420	59	1759	73	3079	128	684	29	389	16																		
	% Change	-10.4%		-3.1%		16.7%		1.9%		-3.0%																			
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	1771	74					862	36	600	25																		
	With-Project	1634	68					1220	51	581	24																		
	% Change	-6.5%						9.9%		-0.5%																			
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	1873	78											898	37														
	With-Project	1775	74											5.4%		1095	46												
	% Change	-4.6%																											
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	1726	72																	1098	46								
	With-Project	1741	73													2.5%				1189	50								
	% Change	0.7%																											
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	1797	75																					1355	56				
	With-Project	1797	75																	4.4%				1513	63				
	% Change	0.0%																											
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	1849	77																									1979	82
	With-Project	1854	77																					2.1%				2056	86
	% Change	0.2%																											
Notes:																													
1.) % Change calculated as the percent difference from Without-Project to With-Project																													
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																													

## Temperance Flat Reservoir Project

**Table 4-7.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – Dry Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Dry Water Year Type																															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration																					
Threshold		18° C		13° C		13° C		16° C		18° C																					
Total Days In Period		Sep - Nov Total (455)		Oct - Dec Total (460)		Oct - Mar Total (912)		Jan - May Total (757)		Jan - May Total (757)																					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count																				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	334	14	334	14	0	0	0	0																				
	With-Project	0	0	46	2	70	3	0	0	0	0																				
	% Change	0.0%		-62.6%		-28.9%		0.0%		0.0%																					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	366	15	386	16	525	22	265	11	223	9																				
	With-Project	317	13	335	14	701	29	276	12	197	8																				
	% Change	-10.8%		-11.1%		19.3%		1.5%		-3.4%																					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	392	16					300	13	261	11																				
	With-Project	358	15					421	18	251	10																				
	% Change	-7.5%						16.0%		-1.3%																					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	401	17											310	13																
	With-Project	387	16											372	16																
	% Change	-3.1%												8.2%																	
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	380	16															330	14												
	With-Project	377	16															362	15												
	% Change	-0.7%																4.2%													
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	388	16																			393	16								
	With-Project	386	16																			412	17								
	% Change	-0.4%																				2.5%									
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	392	16																							485	20				
	With-Project	391	16																							485	20				
	% Change	-0.2%																								0.0%					
Notes:																															
1.) % Change calculated as the percent difference from Without-Project to With-Project																															
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)																															

## Temperance Flat Reservoir Project

**Table 4-8.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – Normal-Dry Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Normal-Dry Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Sep - Nov Total (546)		Oct - Dec Total (552)		Oct - Mar Total (1092)		Jan - May Total (906)		Jan - May Total (906)	
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	430	18	430	18	0	0	0	0
	With-Project	0	0	126	5	174	7	0	0	0	0
	% Change	0.0%		-55.1%		-23.4%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	430	18	470	20	650	27	192	8	155	6
	With-Project	367	15	485	20	922	38	274	11	115	5
	% Change	-11.5%		2.7%		24.9%		9.1%		-4.4%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	469	20					292	12	191	8
	With-Project	424	18					455	19	215	9
	% Change	-8.2%						18.0%		2.6%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	499	21					348	15		
	With-Project	470	20					424	18		
	% Change	-5.3%						8.4%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	458	19					396	17		
	With-Project	453	19					426	18		
	% Change	-0.9%						3.3%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	474	20					452	19		
	With-Project	471	20					477	20		
	% Change	-0.5%						2.8%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	493	21					565	24		
	With-Project	490	20					567	24		
	% Change	-0.5%						0.2%			

Notes:  
1.) % Change calculated as the percent difference from Without-Project to With-Project  
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)

## Temperance Flat Reservoir Project

**Table 4-9.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – Normal-Wet Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Normal-Wet Water Year Type															
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration					
Threshold		18° C		13° C		13° C		16° C		18° C					
Total Days In Period		Sep - Nov Total (394)		Oct - Dec Total (368)		Oct - Mar Total (821)		Jan - May Total (758)		Jan - May Total (758)					
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count				
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	296	12	296	12	4	0	0	0				
	With-Project	0	0	87	4	128	5	0	0	0	0				
	% Change	0.0%		-56.8%		-20.5%		-0.5%		0.0%					
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	306	13	317	13	482	20	136	6	118	5				
	With-Project	271	11	330	14	682	28	132	6	77	3				
	% Change	-8.9%		3.5%		24.4%		-0.5%		-5.4%					
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	329	14					166	7	130	5				
	With-Project	307	13					245	10	113	5				
	% Change	-5.6%						10.4%		-2.2%					
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	348	15					155	6						
	With-Project	331	14					206	9						
	% Change	-4.3%						6.7%							
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	320	13					210	9						
	With-Project	316	13					240	10						
	% Change	-1.0%						4.0%							
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	331	14					290	12						
	With-Project	326	14					343	14						
	% Change	-1.3%						7.0%							
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	337	14					443	18						
	With-Project	335	14					445	19						
	% Change	-0.5%						0.3%							
Notes: 1.) % Change calculated as the percent difference from Without-Project to With-Project 2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)															

## Temperance Flat Reservoir Project

**Table 4-10.** Count and Percent of Exceedence of the 7-Day Average Daily Maximum (7DADM) Water Temperature Units for Fall-Run Chinook Salmon for Without-Project and the Percent Change from the With-Project 2070 Conditions – Wet Water Years

Fall-run Chinook Salmon Temperature Threshold Analysis 2070 Conditions- Wet Water Year Type											
Lifestage		Adult Migration		Spawning		Incubation and Emergence		Juvenile Rearing		Juvenile Migration	
Threshold		18° C		13° C		13° C		16° C		18° C	
Total Days In Period		Sep - Nov Total (728)		Oct - Dec Total (736)		Oct - Mar Total (1451)		Jan - May Total (1203)		Jan - May Total (1203)	
2070		Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count	Count	Average Annual Count
Upstream Reach 1A; Friant Dam (SJRRP Mile Post 267.6)	Without-Project	0	0	497	21	497	21	0	0	0	0
	With-Project	0	0	152	6	157	7	0	0	0	0
	% Change	0.0%		-46.9%		-23.4%		0.0%		0.0%	
Upstream Reach 1B; Highway 99 (SJRRP Mile Post 243.1)	Without-Project	538	22	651	27	710	30	23	1	0	0
	With-Project	465	19	609	25	774	32	2	0	0	0
	% Change	-10.0%		-5.7%		4.4%		-1.7%		0.0%	
Upstream Reach 2A; Gravelly Ford (SJRRP Mile Post 229.0)	Without-Project	581	24					104	4	18	1
	With-Project	545	23					99	4	2	0
	% Change	-4.9%						-0.4%		-1.3%	
Upstream Reach 2B; Chowchilla Bypass (SJRRP Mile Post 216.0)	Without-Project	625	26					85	4		
	With-Project	587	24					93	4		
	% Change	-5.2%						0.7%			
Upstream Reach 3; Mendota Dam (SJRRP Mile Post 204.6)	Without-Project	568	24					162	7		
	With-Project	595	25					161	7		
	% Change	3.7%						-0.1%			
Upstream Reach 4; Sack Dam (SJRRP Mile Post 182.0)	Without-Project	604	25					220	9		
	With-Project	614	26					281	12		
	% Change	1.4%						5.1%			
Upstream Reach 5; Bear Creek Confluence (SJRRP Mile Post 135.8)	Without-Project	627	26					486	20		
	With-Project	638	27					559	23		
	% Change	1.5%						6.1%			

Notes:  
1.) % Change calculated as the percent difference from Without-Project to With-Project  
2.) Formula: (With-Project Count / Total Days in Period) - (Without-Project Count / Total Days in Period)



EXHIBIT 5     TEMPERATURE EXCEEDENCE  
ANALYSIS - CURRENT CONDITIONS



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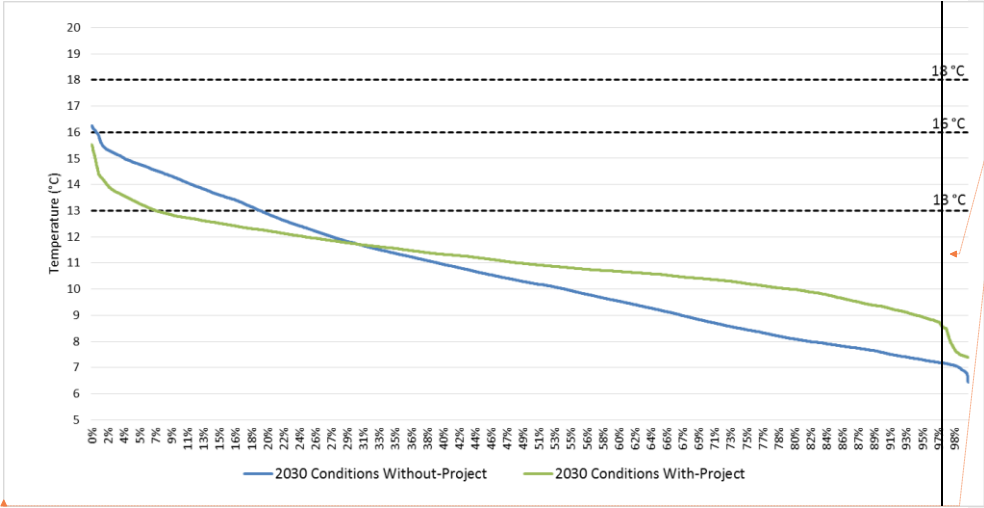
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**Figure 5-1.** Percent Exceedence of the 7-Day Average Daily Maximum Water Temperature (7DADM) Unit for Without-Project Conditions and With-Project Conditions Under Current Conditions for all Water Years – At Head of Reach 1A (Friant Dam) for the 1980 to 2003 Water Year Simulation Period





EXHIBIT 6    TEMPERATURE EXCEEDENCE  
ANALYSIS - 2030 CONDITIONS



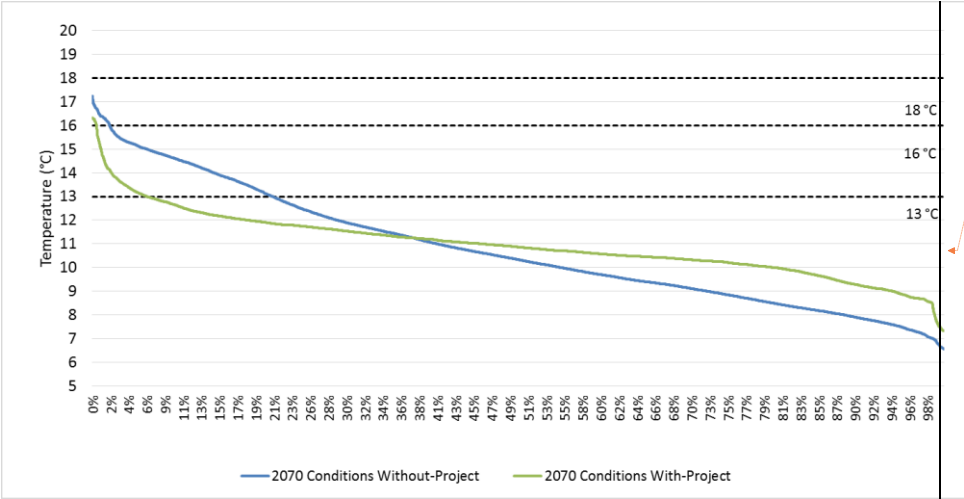
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**Figure 6-1.** Percent Exceedence of the 7-Day Average Daily Maximum Water Temperature (7DADM) Unit for Without-Project Conditions and With-Project Conditions Under 2030 Conditions for all Water Years – At Head of Reach 1A (Friant Dam)



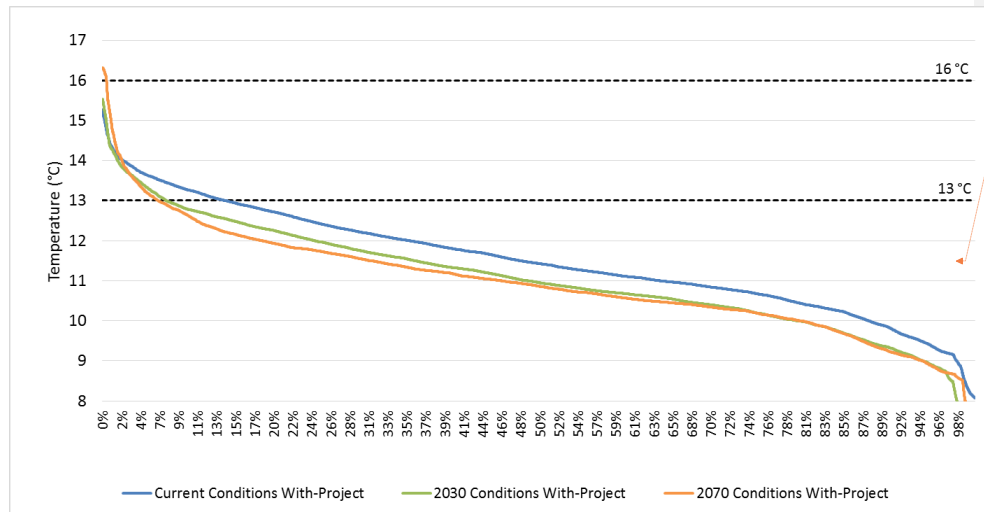
EXHIBIT 7     TEMPERATURE EXCEEDENCE  
ANALYSIS - 2070 CONDITIONS



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**Figure 7-1.** Percent Exceedence of the 7-Day Average Daily Maximum Water Temperature (7DADM) Unit for Without-Project Conditions and With-Project Conditions Under 2070 Conditions for all Water Years – At Head of Reach 1A (Friant Dam)

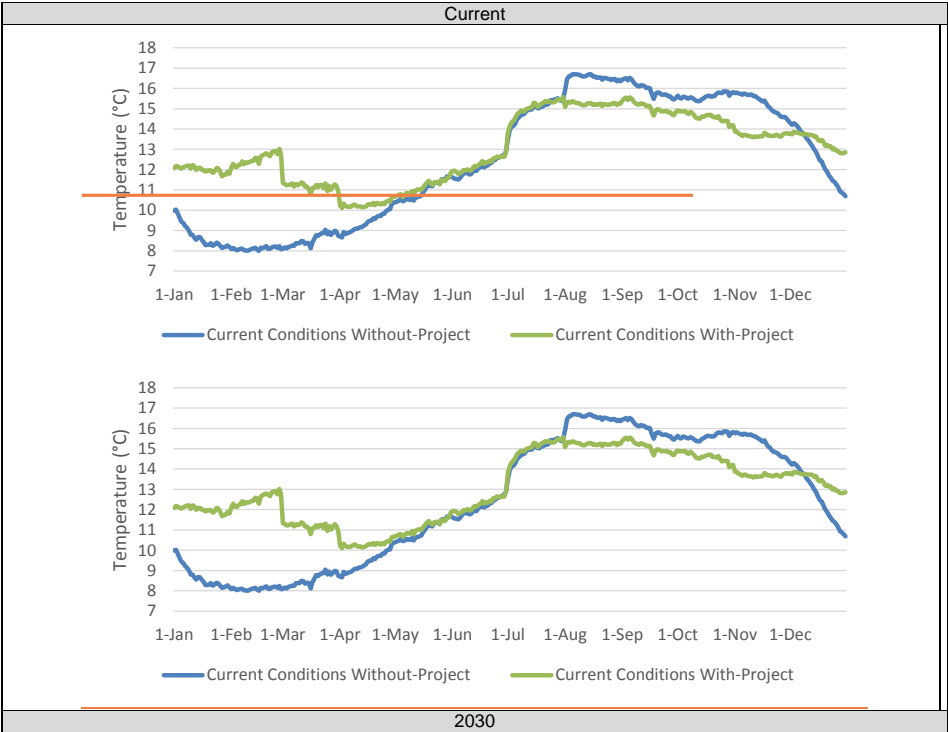
## Temperance Flat Reservoir Project



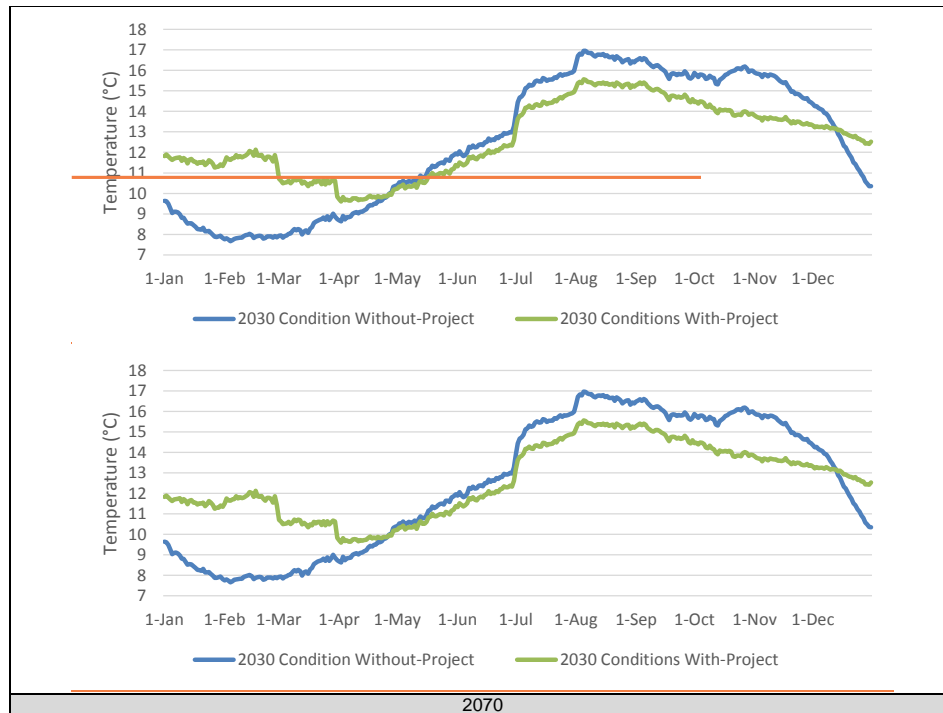
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**Figure 7-2.** Percent Exceedence of the 7-Day Average Daily Maximum Water Temperature (7DADM) Unit for With-Project Conditions Under Current, 2030, and 2070 Conditions for all Water Years – At Head of Reach 1 (Friant Dam)

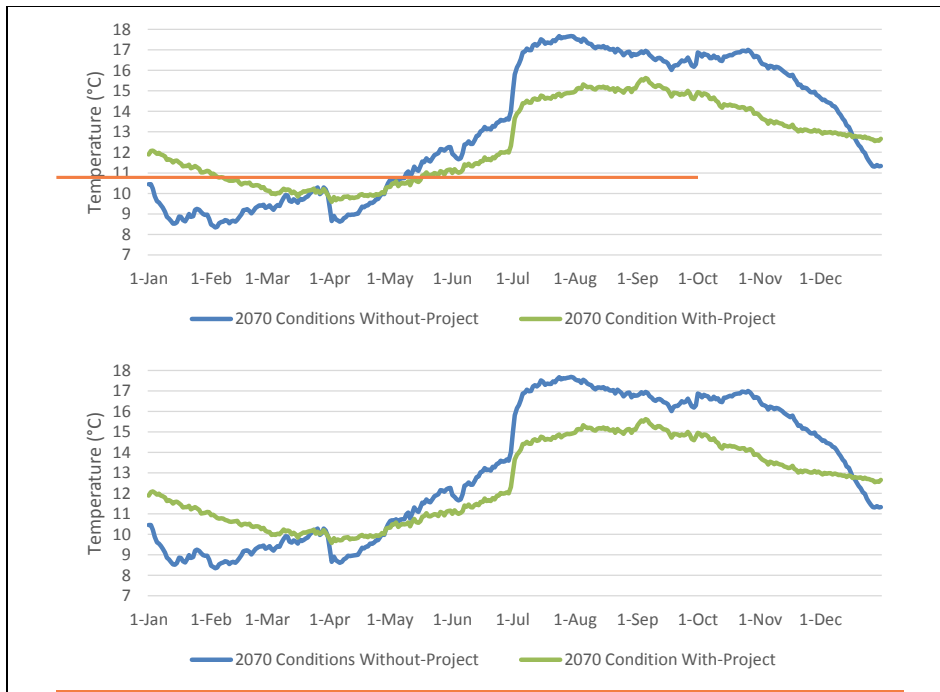
EXHIBIT 8 COLD WATER POOL ANALYSIS



## Temperance Flat Reservoir Project



## Temperance Flat Reservoir Project



**Figure 8-1. Average Maximum Daily Release Temperatures from Friant Dam in Wet Water Years under Current, 2030, and 2070 Conditions With and Without-Project (1983-2003 Water Year Simulation Period)**





## EXHIBIT 9 EDT RESULTS

**Table 9-1.** Percent Change in Abundance by San Joaquin River Restoration Program (SJRRP) Water Year Types for Spring-Run Chinook Salmon Comparing Percent Change in Productivity, Capacity, and Abundance for With-Project to Without-Project Conditions Under Current Conditions

Current Conditions	SJRRP Water Year Type	Change from Without-Project (%)
Habitat Productivity <sup>2</sup>	Dry	4%
	Normal-Dry	0%
	Normal-Wet	4%
	Wet	9%
Habitat Capacity <sup>3</sup>	Dry	17%
	Normal-Dry	37%
	Normal-Wet	-9%
	Wet	-28%
Equilibrium Abundance <sup>4</sup>	Dry	21%
	Normal-Dry	37%
	Normal-Wet	-8%
	Wet	-23%
<b>Weighted Average Abundance IndexMetric <sup>1</sup></b>		<b>2%</b>

Notes:

Further detail for EDT modeling is presented in Benefit Calculation, Monetization, and Resiliency, [REVISED](#) Attachment 5: Modeling Approach Attachment

<sup>1</sup> Uncertainty is inherent within modeling results, and due to the lack of empirical data for spring-run Chinook salmon populations in the San Joaquin River, there is no meaningful way of assessing the accuracy of the data. Further detail for EDT modeling is presented in Benefits, Calculation, Monetization, and Resiliency [REVISED](#), Attachment 5: Modeling Approach Attachment.

<sup>2</sup> Habitat productivity is the number of returning adults per original spawning adult.

<sup>3</sup> Habitat capacity is the number of fish that can be supported by the available habitat

<sup>4</sup> Equilibrium abundance is the theoretical population size that habitat of a given quantity and quality (capacity and productivity) can support.

## Temperance Flat Reservoir Project

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**Table 9-2.** Percent Change in Abundance by San Joaquin River Restoration Program (SJRRP) Water Year Types for Spring-Run Chinook Salmon Comparing Percent Change in Productivity, Capacity, and Abundance for With-Project to Without-Project Conditions Under 2030 Conditions

2030 Conditions	SJRRP Water Year Type	Change from Without-Project (%)
Habitat Productivity <sup>2</sup>	Dry	18%
	Normal-Dry	4%
	Normal-Wet	2522%
	Wet	2720%
Habitat Capacity <sup>3</sup>	Dry	-21%
	Normal-Dry	10%
	Normal-Wet	4510%
	Wet	4912%
Equilibrium Abundance <sup>4</sup>	Dry	-12%
	Normal-Dry	13%
	Normal-Wet	4432%
	Wet	3625%
<b>Weighted Average Abundance IndexMetric <sup>1</sup></b>		<b>2418%</b>

Notes:

Further detail for EDT modeling is presented in Benefit Calculation, Monetization, and Resiliency, [REVISED](#) Attachment 5: Modeling Approach Attachment

<sup>1</sup> Uncertainty is inherent within modeling results, and due to the lack of empirical data for spring-run Chinook salmon populations in the San Joaquin River, there is no meaningful way of assessing the accuracy of the data. Further detail for EDT modeling is presented in Benefits, Calculation, Monetization, and Resiliency, [REVISED](#) Attachment 5: Modeling Approach Attachment.

<sup>2</sup> Habitat productivity is the number of returning adults per original spawning adult.

<sup>3</sup> Habitat capacity is the number of fish that can be supported by the available habitat

<sup>4</sup> Equilibrium abundance is the theoretical population size that habitat of a given quantity and quality (capacity and productivity) can support.

**Table 9-3.** Percent Change in Abundance by San Joaquin River Restoration Program (SJRRP) Water Year Types for Spring-Run Chinook Salmon Comparing Percent Change in Productivity, Capacity, and Abundance for With-Project to Without-Project Conditions Under 2070 Conditions

2070 Conditions	SJRRP Water Year Type	Change from Without-Project (%)
Habitat Productivity <sup>1,2</sup>	Dry	22%
	Normal-Dry	130%
	Normal-Wet	3938%
	Wet	9384%
Habitat Capacity <sup>1,3</sup>	Dry	155%
	Normal-Dry	82%
	Normal-Wet	6263%
	Wet	4737%
Equilibrium Abundance <sup>1,4</sup>	Dry	223%
	Normal-Dry	5105% <sup>5</sup>
	Normal-Wet	116%
	Wet	242181%
<b>Weighted Average Abundance IndexMetric <sup>1</sup></b>		<b>234220%</b>

Notes:

Further detail for EDT modeling is presented in Benefit Calculation, Monetization, and Resiliency, [REVISED](#) Attachment 5: Modeling Approach Attachment

<sup>1</sup> Uncertainty is inherent within modeling results, and due to the lack of empirical data for spring-run Chinook salmon populations in the San Joaquin River, there is no meaningful way of assessing the accuracy of the data. Further detail for EDT modeling is presented in Benefits, Calculation, Monetization, and Resiliency, [REVISED](#) Attachment 5: Modeling Approach Attachment.

<sup>2</sup> Habitat productivity is the number of returning adults per original spawning adult.

<sup>3</sup> Habitat capacity is the number of fish that can be supported by the available habitat

<sup>4</sup> Equilibrium abundance is the theoretical population size that habitat of a given quantity and quality (capacity and productivity) can support.

<sup>5</sup> [Not a typo](#)

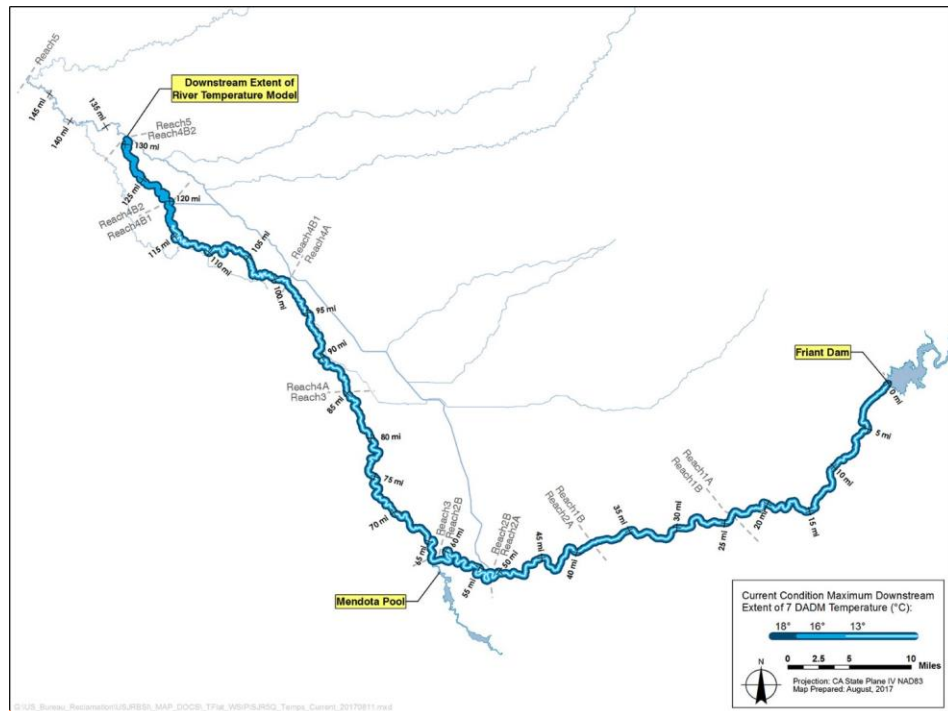


## EXHIBIT 10 GEOGRAPHICAL EXTENT



**Figure 10-1. Geographical Extent of Ecosystem Flow Improvements under Current and 2030 Conditions Represented by the SJRRP Reaches in the San Joaquin River**

## Temperance Flat Reservoir Project



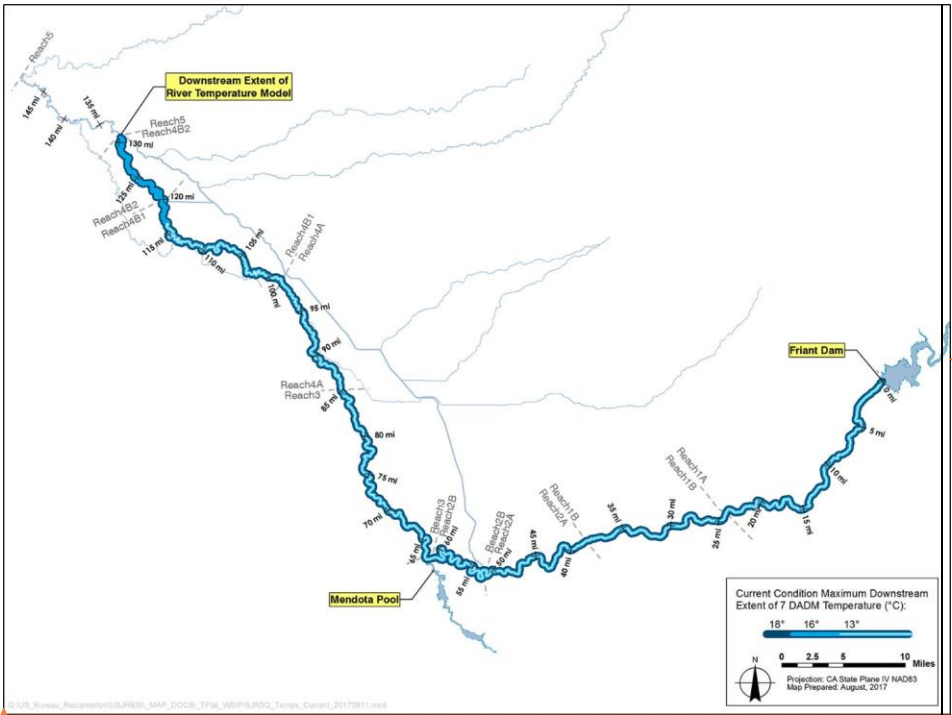
**Figure 10-2.** Geographical Extent of Ecosystem Temperature Improvements Under Current Conditions when the 7-Day Average Daily Maximum Water Temperature (7DADM) Unit for Threshold Criteria for Spring-run Chinook Salmon is Met under With-Project Conditions

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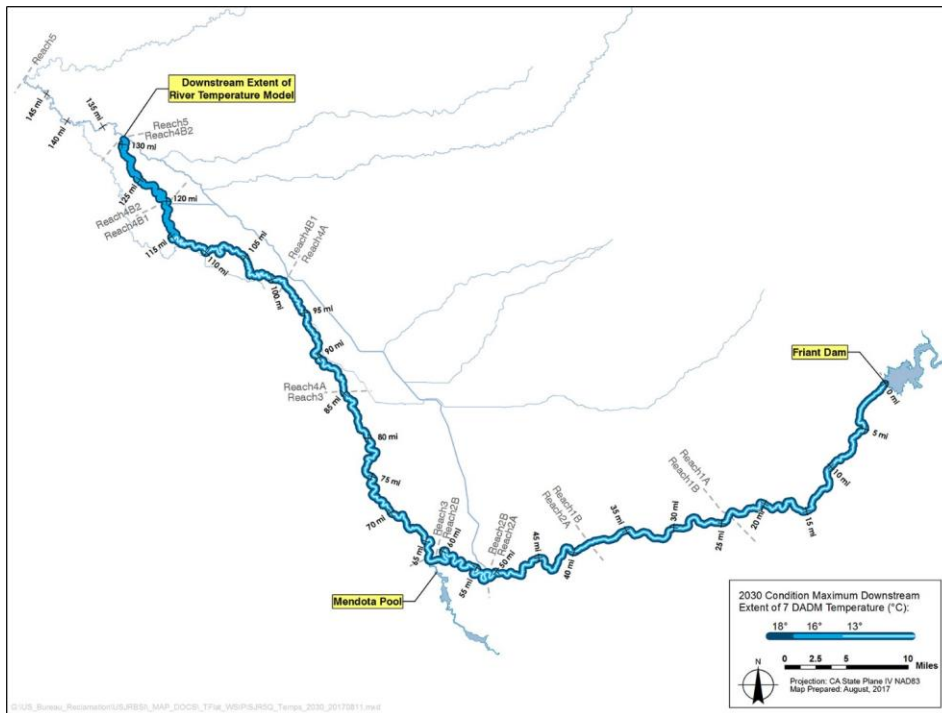
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Temperance Flat Reservoir Project



**Figure 10-3.** Geographical Extent of Ecosystem Temperature Improvements Under Current Conditions when the 7-Day Average Daily Maximum Water Temperature (7DADM) Unit for Threshold Criteria for Fall-run Chinook Salmon is Met under With-Project Conditions

## Temperance Flat Reservoir Project



**Figure 10-4.** Geographical Extent of Ecosystem Temperature Improvements Under 2030 Conditions when the 7-Day Average Daily Maximum Water Temperature (7DADM) Unit for Threshold Criteria for Spring-run Chinook Salmon is Met under With-Project Conditions



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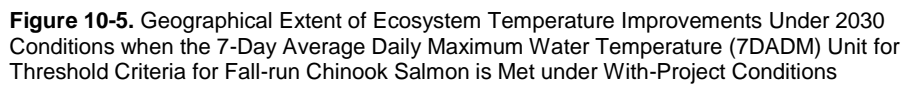




EXHIBIT 11 FLOW EXCEEDENCE – SAN JOAQUIN AT FRIANT DAM – CURRENT CONDITIONS

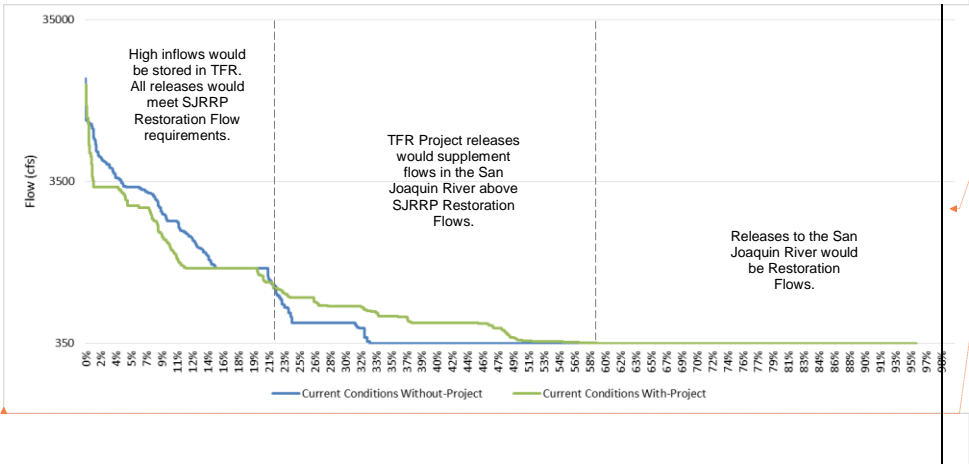


Figure 11-1. Exceedence Probability of San Joaquin River Daily Average Releases at Head of Reach 1A (Friant Dam) for All Years under Current Conditions – 1922 to 2003 Simulation Period



EXHIBIT 12 FLOW EXCEEDENCE – SAN JOAQUIN AT FRIANT DAM – 2030 CONDITIONS

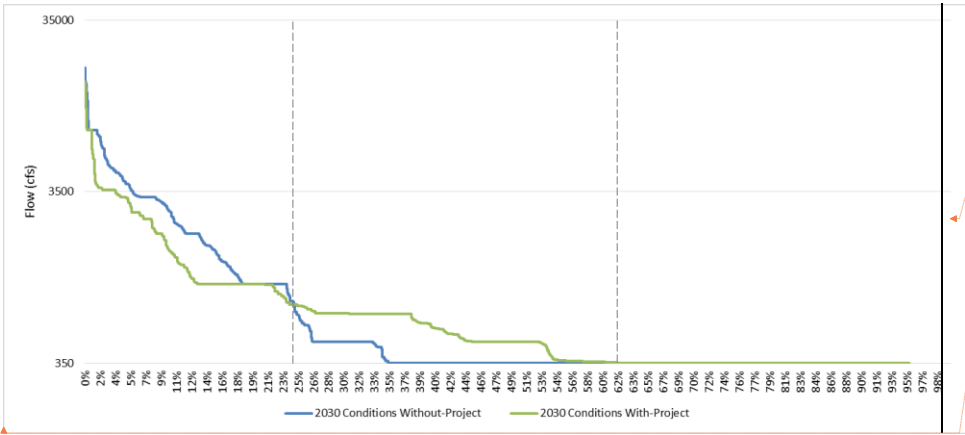
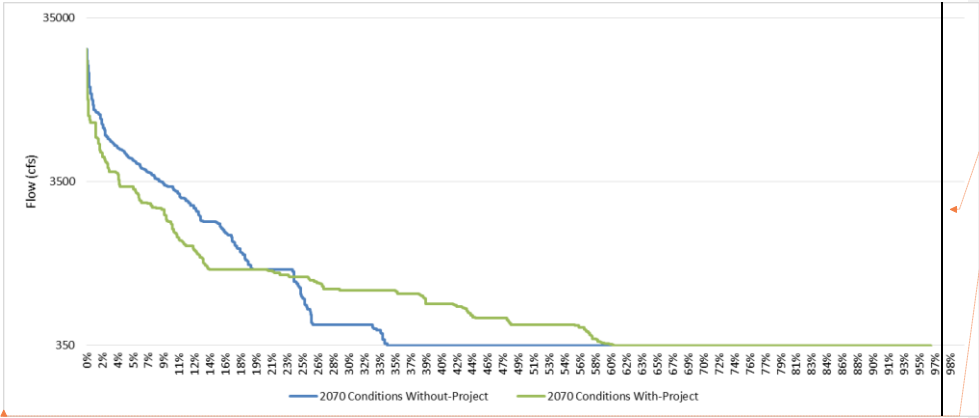


Figure 12-1. Exceedence Probability of San Joaquin River Daily Average Releases at Head of Reach 1A (Friant Dam) for All Years under 2030 Conditions – 1922 to 2003 Simulation Period



EXHIBIT 13 FLOW EXCEEDENCE – SAN JOAQUIN AT FRIANT DAM – 2070 CONDITIONS



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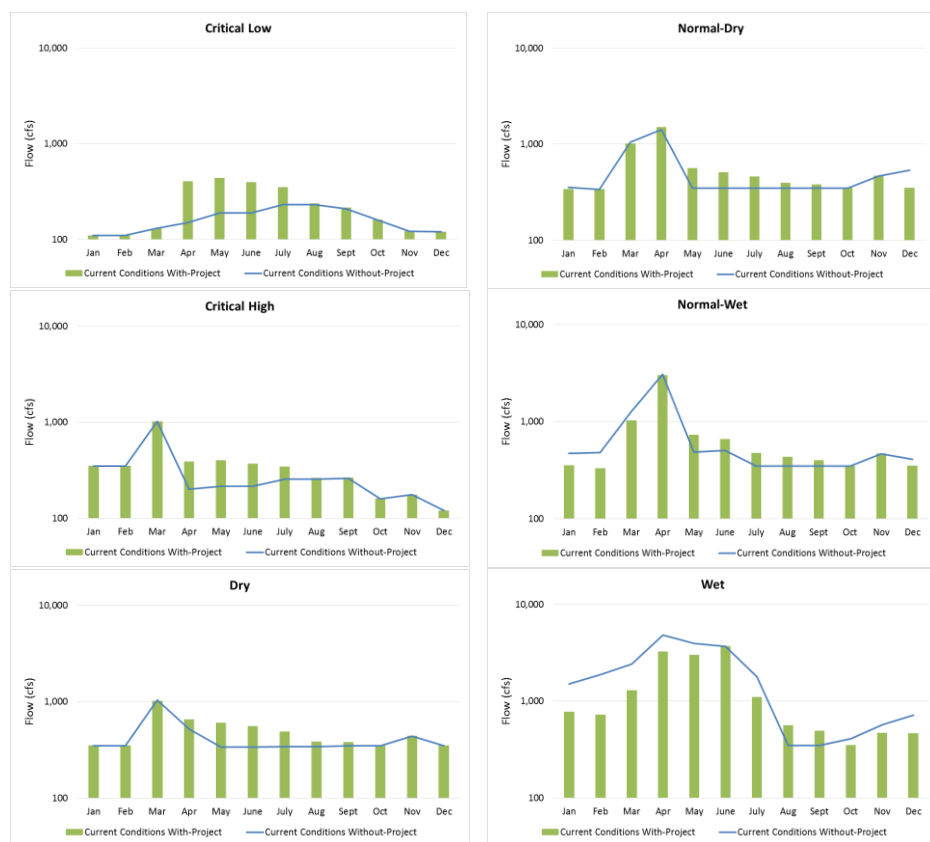
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Figure 13-1. Exceedence Probability of San Joaquin River Daily Average Releases at Head of Reach 1A (Friant Dam) for All Years under 2070 Conditions





## EXHIBIT 14 MONTHLY AVERAGE FLOW – SAN JOAQUIN RIVER AT FRIANT DAM – CURRENT CONDITIONS



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**Figure 14-1.** Average Simulated Monthly Flow (1922 – 2003) in the San Joaquin River at Friant Dam under Current Conditions

**Table 14-1.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Critical-Low Water Years under Current Conditions

Month	Critical Low Year		Percent Change (-100% to 200%)	
	Without-Project CFS	With-Project CFS		
Jan	110	110	0%	
Feb	110	110	0%	
Mar	130	130	0%	
Apr	150	402	168%	
May	190	438	131%	
June	190	396	108%	
July	230	350	52%	
Aug	230	236	3%	
Sept	210	214	2%	
Oct	160	160	0%	
Nov	122	122	0%	
Dec	120	120	0%	

**Table 14-2.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Critical-High Water Years under Current Conditions

Month	Critical High Years		Percent Change (-100% to 200%)	
	Without-Project CFS	With-Project CFS		
Jan	350	350	0%	
Feb	350	350	0%	
Mar	1,016	1,016	0%	
Apr	200	389	95%	
May	215	400	86%	
June	215	370	72%	
July	255	345	35%	
Aug	255	261	2%	
Sept	260	266	2%	
Oct	160	160	0%	
Nov	176	176	0%	
Dec	120	120	0%	

## Temperance Flat Reservoir Project

**Table 14-3.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Dry Water Years under Current Conditions

Month	Dry Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	350	350	0%	
Feb	350	350	0%	
Mar	1,041	1,016	-2%	
Apr	522	652	25%	
May	339	599	77%	
June	339	554	63%	
July	342	489	43%	
Aug	342	384	12%	
Sept	350	380	9%	
Oct	350	350	0%	
Nov	440	440	0%	
Dec	350	350	0%	

**Table 14-4.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Normal-Dry Water Years under Current Conditions

Month	Normal-Dry Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	355	340	-4%	
Feb	340	340	0%	
Mar	1,052	1,016	-3%	
Apr	1,422	1,495	5%	
May	350	561	60%	
June	350	507	45%	
July	350	458	31%	
Aug	350	396	13%	
Sept	350	380	9%	
Oct	350	350	0%	
Nov	467	467	0%	
Dec	539	350	-35%	

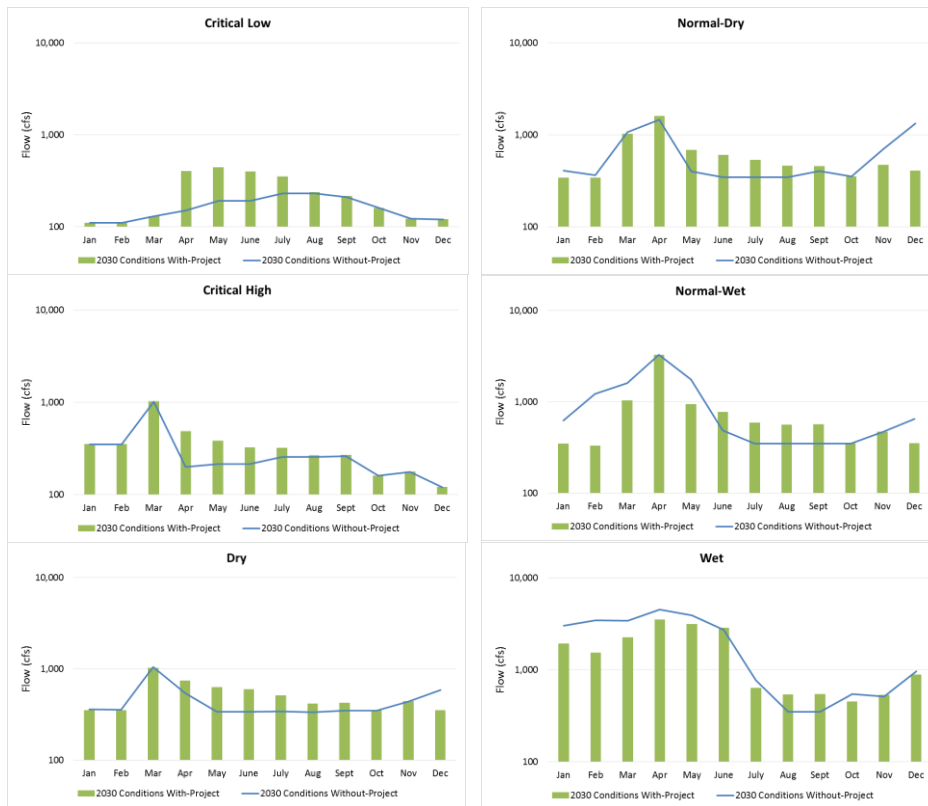
**Table 14-5.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Normal-Wet Years under Current Conditions

Month	Normal-Wet Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	469	355	-24%	
Feb	479	331	-31%	
Mar	1,277	1,026	-20%	
Apr	3,065	3,008	-2%	
May	488	730	50%	
June	505	657	30%	
July	350	475	36%	
Aug	350	431	23%	
Sept	350	398	14%	
Oct	350	350	0%	
Nov	467	467	0%	
Dec	410	350	-15%	

**Table 14-6.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Wet Years under Current Conditions

Month	Wet Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	1,512	774	-49%	
Feb	1,886	723	-62%	
Mar	2,418	1,292	-47%	
Apr	4,837	3,249	-33%	
May	3,944	3,003	-24%	
June	3,673	3,703	1%	
July	1,794	1,095	-39%	
Aug	350	561	60%	
Sept	350	492	41%	
Oct	410	350	-15%	
Nov	572	467	-18%	
Dec	715	463	-35%	

## EXHIBIT 15 MONTHLY AVERAGE FLOW – SAN JOAQUIN RIVER AT FRIANT DAM – 2030 CONDITIONS



**Figure 15-1.** Average Simulated Monthly Flow (1922 – 2003) in the San Joaquin River at Friant Dam under 2030 Conditions

**Table 15-1.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Critical-Low Water Years under 2030 Conditions

Month	Critical Low Year		Percent Change (-100% to 200%)	
	Without-Project CFS	With-Project CFS		
Jan	110	110	0%	
Feb	110	110	0%	
Mar	130	130	0%	
Apr	150	402	168%	
May	190	438	130%	
June	190	396	108%	
July	230	350	52%	
Aug	230	236	3%	
Sept	210	215	2%	
Oct	160	160	0%	
Nov	122	122	0%	
Dec	120	120	0%	

**Table 15-2.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Critical-High Water Years under 2030 Conditions

Month	Critical High Years		Percent Change (-100% to 200%)	
	Without-Project CFS	With-Project CFS		
Jan	350	350	0%	
Feb	350	350	0%	
Mar	1,016	1,016	0%	
Apr	200	485	143%	
May	215	381	77%	
June	215	323	50%	
July	255	319	25%	
Aug	255	263	3%	
Sept	260	267	3%	
Oct	160	160	0%	
Nov	176	176	0%	
Dec	120	120	0%	

## Temperance Flat Reservoir Project













**Table 15-3.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Dry Water Years under 2030 Conditions

Month	Dry Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	360	350	-3%	
Feb	355	350	-2%	
Mar	1,041	1,016	-2%	
Apr	545	737	35%	
May	339	628	85%	
June	339	593	75%	
July	342	509	49%	
Aug	335	412	23%	
Sept	350	423	21%	
Oct	350	350	0%	
Nov	438	440	1%	
Dec	585	350	-40%	













**Table 15-4.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Normal-Dry Water Years under 2030 Conditions

Month	Normal-Dry Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	406	340	-16%	
Feb	362	340	-6%	
Mar	1,066	1,016	-5%	
Apr	1,459	1,593	9%	
May	398	684	72%	
June	343	600	75%	
July	345	528	53%	
Aug	345	458	33%	
Sept	401	454	13%	
Oct	351	350	0%	
Nov	697	467	-33%	
Dec	1,328	405	-70%	

**Table 15-5.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Normal-Wet Years under 2030 Conditions

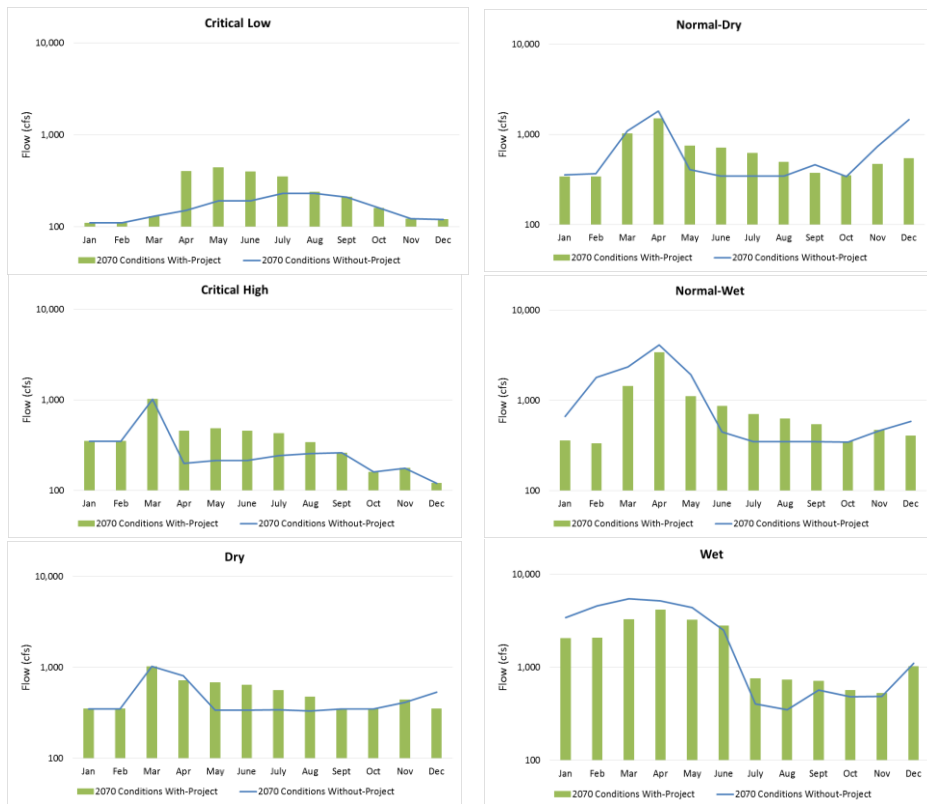
Month	Normal-Wet Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	624	346	-45%	
Feb	1,220	331	-73%	
Mar	1,604	1,026	-36%	
Apr	3,275	3,241	-1%	
May	1,757	942	-46%	
June	483	769	59%	
July	350	585	67%	
Aug	350	556	59%	
Sept	350	562	60%	
Oct	350	350	0%	
Nov	467	467	0%	
Dec	647	350	-46%	

**Table 15-6.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Wet Years under 2030 Conditions

Month	Wet Years		Percent Change (-100% to 100%)	
	Without-Project CFS	With-Project CFS		
Jan	3,005	1,923	-36%	
Feb	3,453	1,533	-56%	
Mar	3,426	2,249	-34%	
Apr	4,510	3,502	-22%	
May	3,891	3,131	-20%	
June	2,726	2,841	4%	
July	762	632	-17%	
Aug	350	533	52%	
Sept	350	540	54%	
Oct	546	451	-17%	
Nov	511	528	3%	
Dec	966	879	-9%	



## EXHIBIT 16 MONTHLY AVERAGE FLOW – SAN JOAQUIN RIVER AT FRIANT DAM – 2070 CONDITIONS



**Figure 16-1.** Average Simulated Monthly Flow (1922 – 2003) in the San Joaquin River at Friant Dam under 2070 Conditions

**Table 16-1.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Critical-Low Water Years under 2070 Conditions

Month	Critical Low Year		Percent Change (-100% to 200%)	
	Without-Project CFS	With-Project CFS		
Jan	110	110	0%	
Feb	110	110	0%	
Mar	130	130	0%	
Apr	150	402	168%	
May	190	439	131%	
June	190	397	109%	
July	230	352	53%	
Aug	230	239	4%	
Sept	210	210	0%	
Oct	160	160	0%	
Nov	122	122	0%	
Dec	120	120	0%	

**Table 16-2.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Critical-High Water Years under 2070 Conditions

Month	Critical High Years		Percent Change (-100% to 200%)	
	Without-Project CFS	With-Project CFS		
Jan	350	350	0%	
Feb	350	350	0%	
Mar	1,016	1,016	0%	
Apr	200	452	126%	
May	215	481	124%	
June	215	453	111%	
July	242	425	75%	
Aug	255	340	33%	
Sept	260	260	0%	
Oct	160	160	0%	
Nov	176	176	0%	
Dec	120	120	0%	

## Temperance Flat Reservoir Project

**Table 16-3.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Dry Water Years under 2070 Conditions

Dry Years				
Month	Without-Project CFS	With-Project CFS	Percent Change (-100% to 100%)	
Jan	350	350	0%	
Feb	350	350	0%	
Mar	1,025	1,016	-1%	
Apr	807	714	-11%	
May	339	678	100%	*
June	339	638	88%	
July	342	560	64%	
Aug	332	473	42%	
Sept	350	351	0%	
Oct	350	350	0%	
Nov	412	440	7%	
Dec	536	350	-35%	

\* Indicates percent change is greater than 100%

**Table 16-4.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Normal-Dry Water Years under 2070 Conditions

Normal-Dry Years				
Month	Without-Project CFS	With-Project CFS	Percent Change (-100% to 100%)	
Jan	354	340	-4%	
Feb	369	340	-8%	
Mar	1,090	1,016	-7%	
Apr	1,803	1,502	-17%	
May	409	748	83%	
June	343	712	107%	*
July	345	621	80%	
Aug	345	492	42%	
Sept	462	371	-20%	
Oct	341	350	3%	
Nov	737	467	-37%	
Dec	1,455	541	-63%	

\* Indicates percent change is greater than 100%

**Table 16-5.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Normal-Wet Years under 2070 Conditions

Normal-Wet Years				
Month	Without-Project	With-Project	Percent Change (-100% to 100%)	
	CFS	CFS		
Jan	663	358	-46%	
Feb	1,795	333	-81%	
Mar	2,347	1,434	-39%	
Apr	4,093	3,406	-17%	
May	1,933	1,112	-42%	
June	448	860	92%	
July	350	701	100%	*
Aug	350	624	78%	
Sept	350	543	55%	
Oct	345	350	1%	
Nov	459	467	2%	
Dec	586	407	-31%	

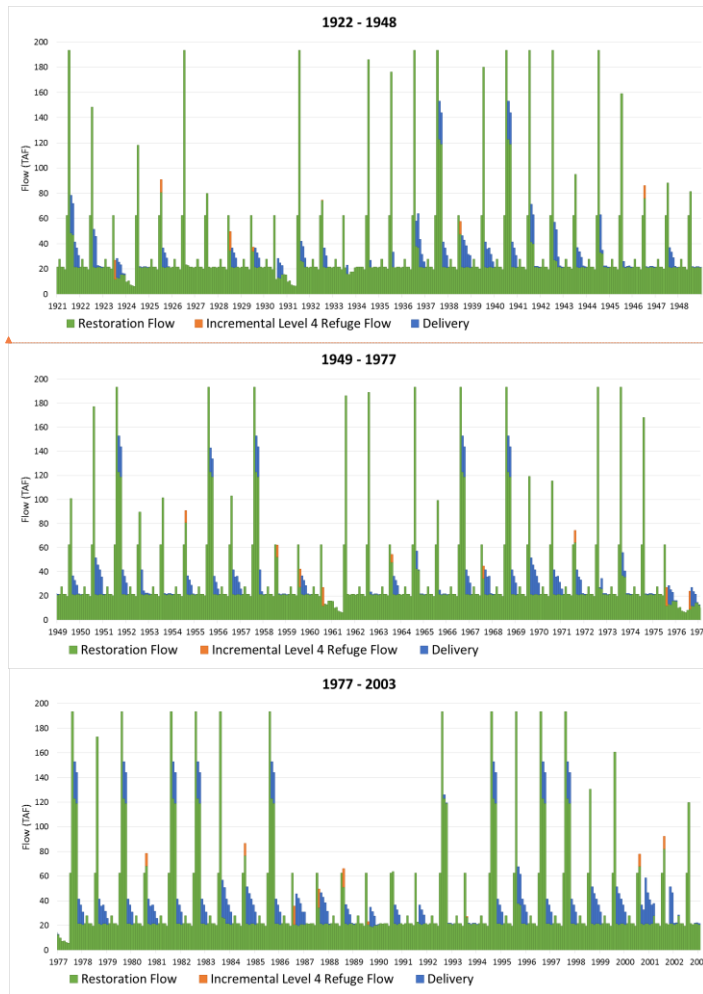
\* Indicates percent change is greater than 100%

**Table 16-6.** Average Simulated Monthly Flow in the San Joaquin River at Friant Dam for Wet Years under 2070 Conditions

Wet Years				
Month	Without-Project	With-Project	Percent Change (-100% to 100%)	
	CFS	CFS		
Jan	3,420	2,048	-40%	
Feb	4,573	2,066	-55%	
Mar	5,413	3,241	-40%	
Apr	5,178	4,114	-21%	
May	4,369	3,221	-26%	
June	2,510	2,787	11%	
July	402	753	87%	
Aug	350	731	109%	*
Sept	569	712	25%	
Oct	483	562	16%	
Nov	486	526	8%	
Dec	1,100	1,021	-7%	

\* Indicates percent change is greater than 100%

## EXHIBIT 17 MONTHLY RELEASE PATTERN – CURRENT CONDITIONS

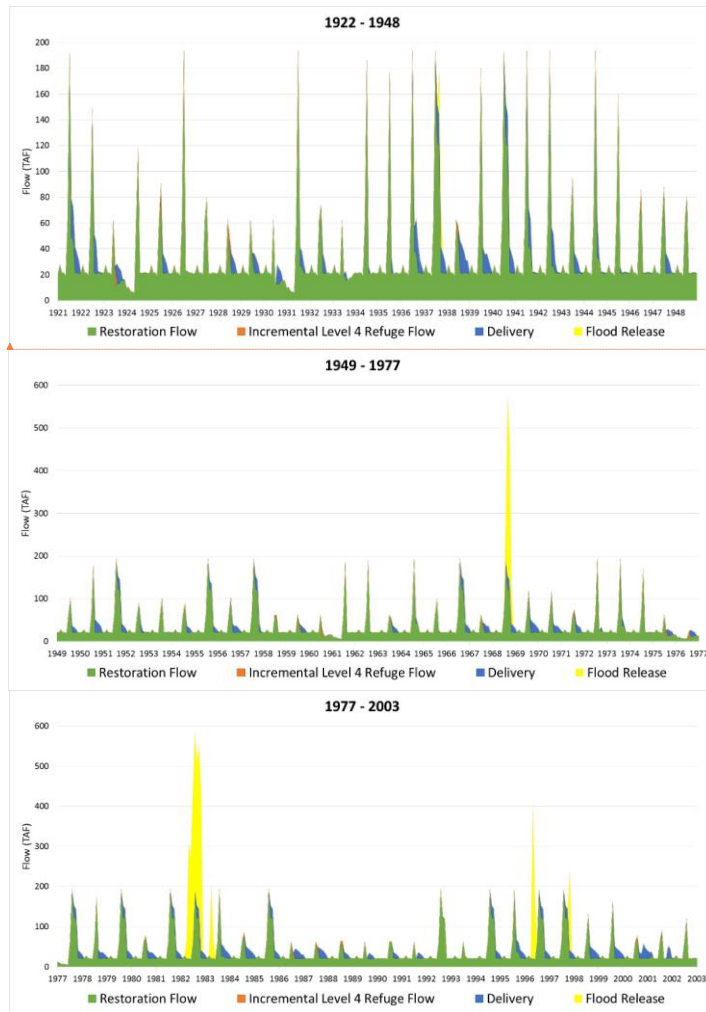


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**Figure 17-1.** Monthly Objective Release Pattern from Friant Dam for the Temperance Flat Reservoir Project for Simulation Period of 1922-2003 Water Years under Current Conditions

## Temperance Flat Reservoir Project

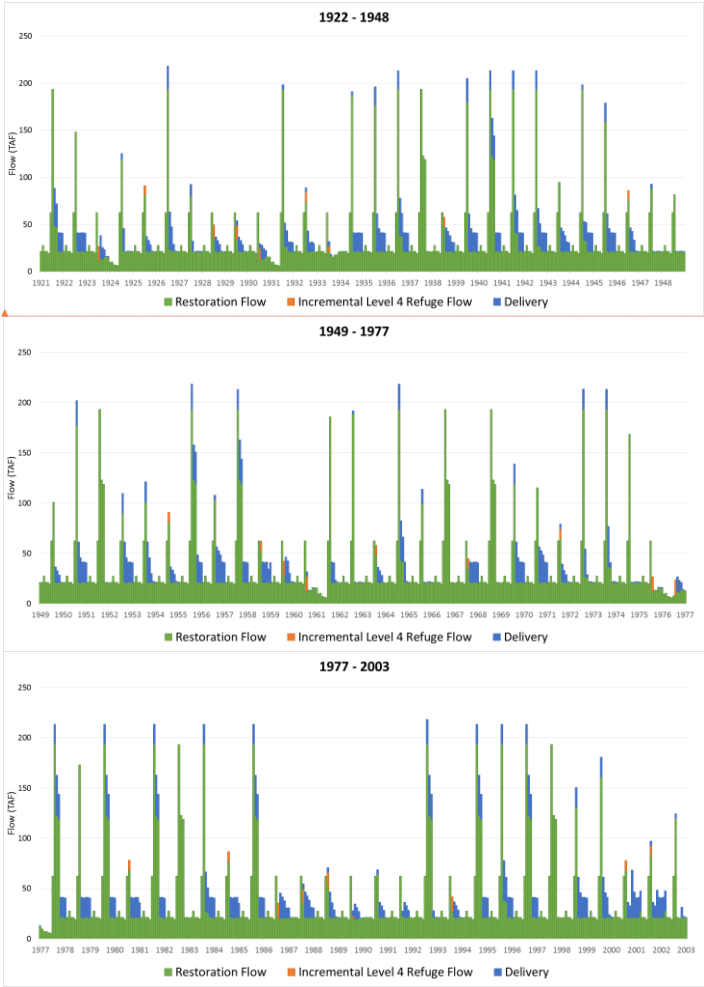


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**Figure 17-2.** Monthly Releases from Friant Dam for the Temperance Flat Reservoir Project for Simulation Period of 1922-2003 Water Years under Current Conditions (Note the axis change in 1922-1948 time period)

EXHIBIT 18 MONTHLY RELEASE PATTERN  
– 2030 CONDITIONS

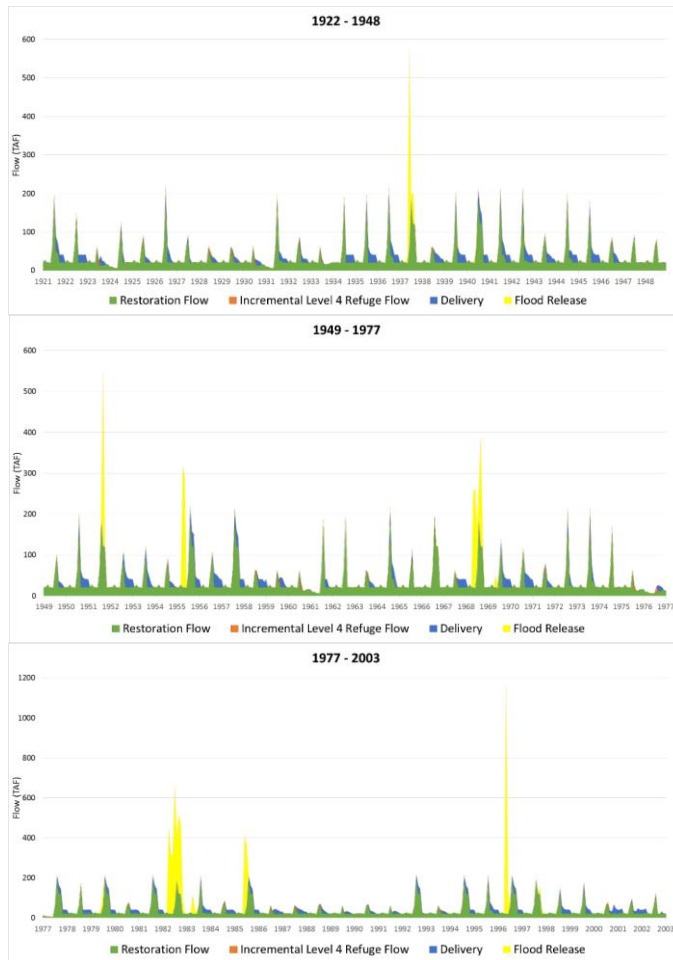


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Figure 18-1. Monthly Objective Release Pattern from Friant Dam for the Temperance Flat Reservoir Project for Simulation Period of 1922-2003 Water Years under 2030 Conditions

## Temperance Flat Reservoir Project

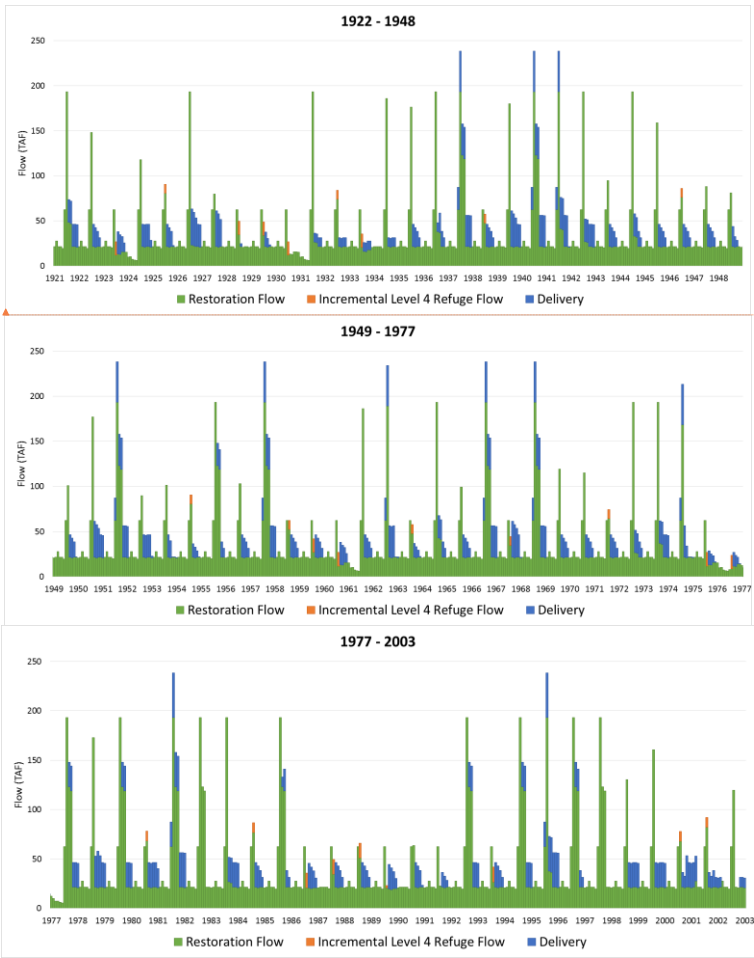


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**Figure 18-2.** Monthly Releases from Friant Dam for the Temperance Flat Reservoir Project for Simulation Period of 1922-2003 Water Years under 2030 Conditions (Note the axis change in 1977-2003 time period)



EXHIBIT 19 MONTHLY RELEASE PATTERN  
– 2070 CONDITIONS

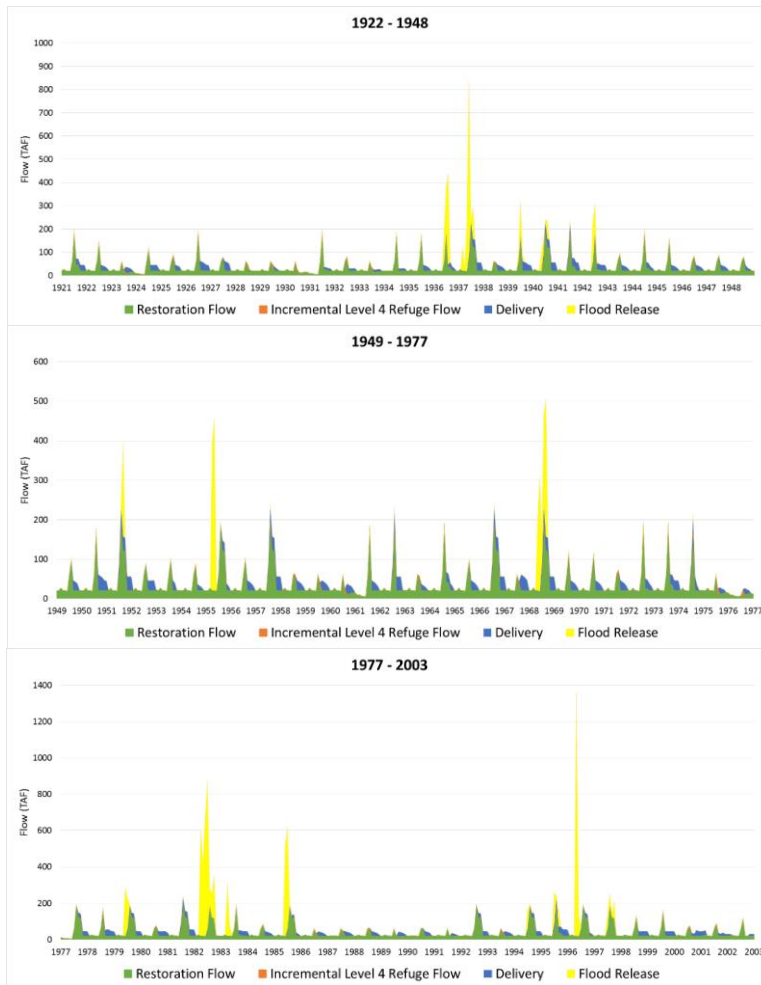


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Figure 19-1. Monthly Objective Releases from Friant Dam for the Temperance Flat Reservoir Project for Simulation Period of 1922-2003 Water Years under 2070 Conditions

## Temperance Flat Reservoir Project



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**Figure 19-2.** Monthly Releases from Friant Dam for the Temperance Flat Reservoir Project for Simulation Period of 1922-2003 Water Years under 2070 Conditions (Note the axis change in each time period)

EXHIBIT 20    SAN JOAQUIN RIVER  
RESTORATION PROGRAM (SJRRP) –  
FLOW MANAGEMENT AND SCHEDULE

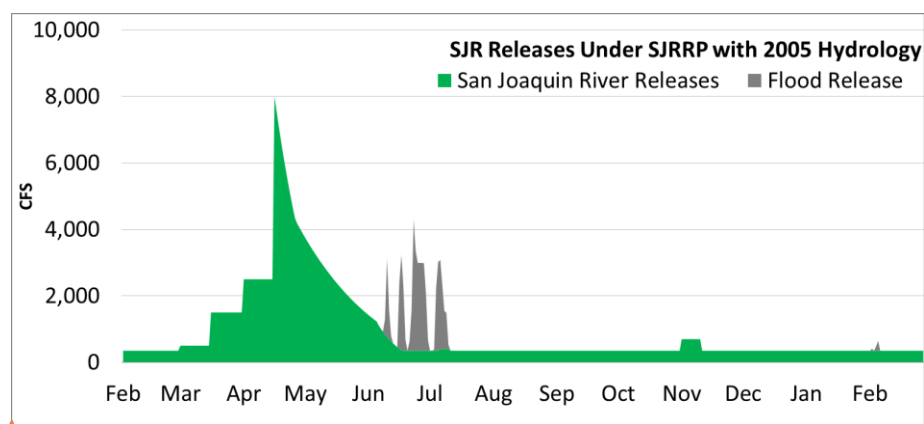


Figure 20-1. Simulated SJRRP Restoration Flow Management of 2005 Historical Hydrology

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Temperance Flat Reservoir Project

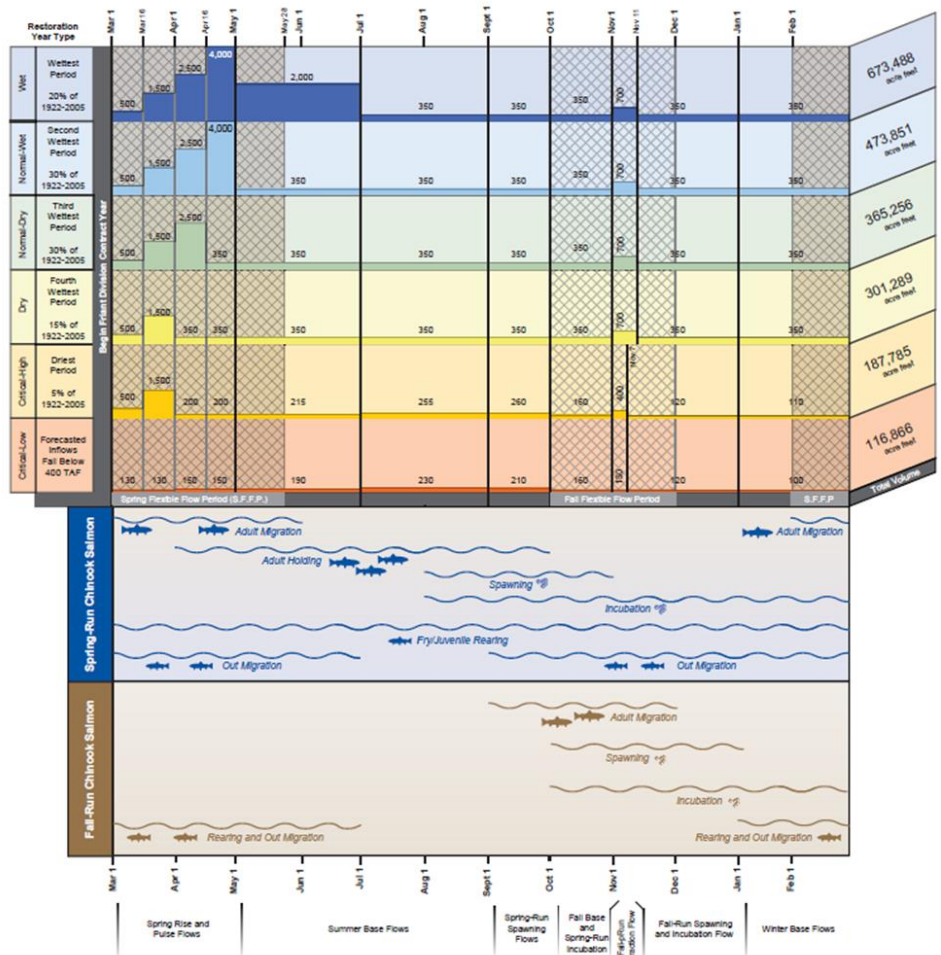


Figure 20-2. Restoration Flow Schedule Specific in Exhibit B of the Settlement

## EXHIBIT 21 FLOODPLAIN ACTIVATION FLOW – CURRENT CONDITIONS

**Table 21-1.** Summary of Floodplain Activation Flow Analysis for All Years under Current Conditions

Current Conditions - All Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1149	1317	15%
	SJR 1A2	Hwy 41 to Hwy 99	1061	1229	16%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	949	1117	18%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	884	1046	18%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	858	1020	19%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	853	1015	19%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	1111	1263	14%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	1112	1264	14%
	SJR 4A1	Sack Dam to Hwy 152	877	1049	20%
4	SJR 4A2	Hwy 152 to Sand Slough Connector	877	1049	20%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
	SJR 4B2	Mariposa Bypass to Bear Creek	877	1049	20%
5	SJR 5A	Bear Creek to Salt Slough	1200	1360	13%
	SJR 5B	Salt Slough to Mud Slough	1481	1511	2%
	SJR 5C	Mud Slough to Merced River	1794	1661	-7%

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**Table 21-2.** Summary of Floodplain Activation Flow Analysis for Dry Years under Current Conditions

Current Conditions - Dry Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1016	1016	0%
	SJR 1A2	Hwy 41 to Hwy 99	936	936	0%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	833	833	0%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	774	774	0%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	750	750	0%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	745	745	0%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	961	961	0%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	961	961	0%
	SJR 4A1	Sack Dam to Hwy 152	751	750	0%
4	SJR 4A2	Hwy 152 to Sand Slough Connector	751	750	0%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
	SJR 4B2	Mariposa Bypass to Bear Creek	751	750	0%
5	SJR 5A	Bear Creek to Salt Slough	820	820	0%
	SJR 5B	Salt Slough to Mud Slough	1146	1146	0%
	SJR 5C	Mud Slough to Merced River	1369	1365	0%

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## Temperance Flat Reservoir Project

**Table 21-3.** Summary of Floodplain Activation Flow Analysis for Normal-Dry Years under Current Conditions

Current Conditions - Normal Dry Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1142	1311	15%
	SJR 1A2	Hwy 41 to Hwy 99	1055	1223	16%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	942	1111	18%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	878	1046	19%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	852	1020	20%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	847	1015	20%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	1076	1263	17%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	1077	1264	17%
4	SJR 4A1	Sack Dam to Hwy 152	842	1049	24%
	SJR 4A2	Hwy 152 to Sand Slough Connector	842	1049	24%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
	SJR 4B2	Mariposa Bypass to Bear Creek	843	1049	24%
5	SJR 5A	Bear Creek to Salt Slough	1150	1253	9%
	SJR 5B	Salt Slough to Mud Slough	1377	1477	7%
	SJR 5C	Mud Slough to Merced River	1664	1655	-1%

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**Table 21-4.** Summary of Floodplain Activation Flow Analysis for Normal-Wet Years under Current Conditions

Current Conditions - Normal Wet Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	2700	2700	0%
	SJR 1A2	Hwy 41 to Hwy 99	2589	2500	-3%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	2447	2245	-8%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	2366	2099	-11%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	2332	2039	-13%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	2325	2029	-13%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	2613	2174	-17%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	2614	2174	-17%
4	SJR 4A1	Sack Dam to Hwy 152	2379	2036	-14%
	SJR 4A2	Hwy 152 to Sand Slough Connector	2379	2036	-14%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
	SJR 4B2	Mariposa Bypass to Bear Creek	2380	2037	-14%
5	SJR 5A	Bear Creek to Salt Slough	2739	2395	-13%
	SJR 5B	Salt Slough to Mud Slough	2896	2547	-12%
	SJR 5C	Mud Slough to Merced River	2986	2629	-12%

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## Temperance Flat Reservoir Project

**Table 21-5.** Summary of Floodplain Activation Flow Analysis for Wet Years under Current Conditions

Current Conditions - Wet Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	4274	3249	-24%
	SJR 1A2	Hwy 41 to Hwy 99	4557	3130	-31%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	4690	2977	-37%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	4766	2890	-39%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	4797	2854	-41%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	2865	2846	-1%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	5470	2871	-48%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	5471	2872	-48%
4	SJR 4A1	Sack Dam to Hwy 152	5236	2637	-50%
	SJR 4A2	Hwy 152 to Sand Slough Connector	5236	2637	-50%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 4B2	Mariposa Bypass to Bear Creek	7191	2639	-63%*
	SJR 5A	Bear Creek to Salt Slough	8433	3184	-62%*
	SJR 5B	Salt Slough to Mud Slough	8679	3319	-62%*
	SJR 5C	Mud Slough to Merced River	8852	3398	-62%*

\* Indicates greater than 50% change

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## EXHIBIT 22 FLOODPLAIN ACTIVATION FLOW – 2030 CONDITIONS

**Table 22-1.** Summary of Floodplain Activation Flow Analysis for All Years under 2030 Conditions

2030 Conditions - All Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1066	1317	24%
	SJR 1A2	Hwy 41 to Hwy 99	978	1229	26%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	866	1117	29%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	802	1052	31%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	776	1026	32%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	772	1021	32%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	1003	1298	29%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	1004	1299	29%
4	SJR 4A1	Sack Dam to Hwy 152	812	1064	31%
	SJR 4A2	Hwy 152 to Sand Slough Connector	812	1064	31%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 4B2	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 4B2	Mariposa Bypass to Bear Creek	812	1065	31%
	SJR 5A	Bear Creek to Salt Slough	940	1376	46%
	SJR 5B	Salt Slough to Mud Slough	1165	1529	31%
	SJR 5C	Mud Slough to Merced River	1464	1661	14%

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**Table 22-2.** Summary of Floodplain Activation Flow Analysis for Dry Years under 2030 Conditions

2030 Conditions - Dry Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	814	1016	25%
	SJR 1A2	Hwy 41 to Hwy 99	734	936	27%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	633	833	32%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	575	774	35%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	551	750	36%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	547	745	36%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	656	961	47%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	656	961	47%
4	SJR 4A1	Sack Dam to Hwy 152	402	750	86%
	SJR 4A2	Hwy 152 to Sand Slough Connector	402	750	86%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	398	476	19%
	SJR4B 1C and 4B2	Turner Ave to Mariposa Bypass	398	476	19%
5	SJR 4B2	Mariposa Bypass to Bear Creek	403	750	86%
	SJR 5A	Bear Creek to Salt Slough	484	820	69%
	SJR 5B	Salt Slough to Mud Slough	798	1146	44%
	SJR 5C	Mud Slough to Merced River	1018	1365	34%

\* Indicates greater than 50% change

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## Temperance Flat Reservoir Project

**Table 22-3.** Summary of Floodplain Activation Flow Analysis for Normal-Dry Years under 2030 Conditions

2030 Conditions - Normal Dry Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	963	1311	36%
	SJR 1A2	Hwy 41 to Hwy 99	875	1223	40%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	763	1111	45%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	699	1046	50%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	673	1020	52%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	669	1015	52%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	935	1263	35%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	935	1264	35%
	SJR 4A1	Sack Dam to Hwy 152	701	1029	47%
4	SJR 4A2	Hwy 152 to Sand Slough Connector	701	1029	47%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
	SJR 4B2	Mariposa Bypass to Bear Creek	701	1030	47%
5	SJR 5A	Bear Creek to Salt Slough	924	1253	36%
	SJR 5B	Salt Slough to Mud Slough	1159	1477	27%
	SJR 5C	Mud Slough to Merced River	1440	1655	15%

\* Indicates greater than 50% change

**Table 22-4.** Summary of Floodplain Activation Flow Analysis for Normal-Wet Years under 2030 Conditions

2030 Conditions - Normal Wet Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1856	3037	64%
	SJR 1A2	Hwy 41 to Hwy 99	1768	3023	71%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	1654	3004	82%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	1589	2994	88%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	1562	2990	91%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	1558	2985	92%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	1745	2953	69%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	1746	2954	69%
4	SJR 4A1	Sack Dam to Hwy 152	1511	2719	80%
	SJR 4A2	Hwy 152 to Sand Slough Connector	1511	2719	80%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 4B2	Mariposa Bypass to Bear Creek	1513	2721	80%
	SJR 5A	Bear Creek to Salt Slough	1720	3080	79%
	SJR 5B	Salt Slough to Mud Slough	1876	3237	73%
	SJR 5C	Mud Slough to Merced River	2164	3326	54%

\* Indicates greater than 50% change

## Temperance Flat Reservoir Project

**Table 22-5.** Summary of Floodplain Activation Flow Analysis for Wet Years under 2030 Conditions

2030 Conditions - Wet Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	4160	3585	-14%
	SJR 1A2	Hwy 41 to Hwy 99	4041	3550	-12%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	3888	3862	-1%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	3801	4057	7%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	3765	4187	11%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	2896	3266	13%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	4526	4903	8%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	4540	4904	8%
	SJR 4A1	Sack Dam to Hwy 152	4314	4669	8%
4	SJR 4A2	Hwy 152 to Sand Slough Connector	4317	4669	8%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
	SJR 4B2	Mariposa Bypass to Bear Creek	6149	6538	6%
	SJR 5A	Bear Creek to Salt Slough	7775	7859	1%
5	SJR 5B	Salt Slough to Mud Slough	7921	8176	3%
	SJR 5C	Mud Slough to Merced River	8023	8280	3%



## EXHIBIT 23 FLOODPLAIN ACTIVATION FLOW – 2070 CONDITIONS

**Table 23-1.** Summary of Floodplain Activation Flow Analysis for All Years under 2070 Conditions

2070 Conditions - All Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1149	1317	15%
	SJR 1A2	Hwy 41 to Hwy 99	1061	1229	16%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	949	1117	18%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	884	1046	18%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	858	1020	19%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	853	1015	19%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	1111	1263	14%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	1112	1264	14%
4	SJR 4A1	Sack Dam to Hwy 152	877	1049	20%
	SJR 4A2	Hwy 152 to Sand Slough Connector	877	1049	20%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 4B2	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 4B2	Mariposa Bypass to Bear Creek	877	1049	20%
	SJR 5A	Bear Creek to Salt Slough	1200	1360	13%
	SJR 5B	Salt Slough to Mud Slough	1481	1511	2%
	SJR 5C	Mud Slough to Merced River	1794	1661	-7%

**Table 23-2.** Summary of Floodplain Activation Flow Analysis for Dry Years under 2070 Conditions

2070 Conditions - Dry Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1016	1016	0%
	SJR 1A2	Hwy 41 to Hwy 99	936	936	0%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	833	833	0%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	774	774	0%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	750	750	0%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	745	745	0%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	961	961	0%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	961	961	0%
4	SJR 4A1	Sack Dam to Hwy 152	750	750	0%
	SJR 4A2	Hwy 152 to Sand Slough Connector	750	750	0%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 4B2	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 4B2	Mariposa Bypass to Bear Creek	750	750	0%
	SJR 5A	Bear Creek to Salt Slough	820	820	0%
	SJR 5B	Salt Slough to Mud Slough	1146	1146	0%
	SJR 5C	Mud Slough to Merced River	1365	1365	0%

## Temperance Flat Reservoir Project

**Table 23-3.** Summary of Floodplain Activation Flow Analysis for Normal-Dry Years under 2070 Conditions

2070 Conditions - Normal Dry Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	1142	1311	15%
	SJR 1A2	Hwy 41 to Hwy 99	1055	1223	16%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	942	1111	18%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	878	1046	19%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	852	1020	20%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	847	1015	20%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	1087	1255	15%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	1088	1256	15%
4	SJR 4A1	Sack Dam to Hwy 152	853	1021	20%
	SJR 4A2	Hwy 152 to Sand Slough Connector	853	1021	20%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 4B2	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 5A	Mariposa Bypass to Bear Creek	854	1022	20%
	SJR 5A	Bear Creek to Salt Slough	1145	1245	9%
	SJR 5B	Salt Slough to Mud Slough	1365	1476	8%
	SJR 5C	Mud Slough to Merced River	1659	1659	0%

**Table 23-4.** Summary of Floodplain Activation Flow Analysis for Normal-Wet Years under 2070 Conditions

2070 Conditions - Normal Wet Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	3249	2700	-17%
	SJR 1A2	Hwy 41 to Hwy 99	3130	2867	-8%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	2977	2977	0%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	2890	2890	0%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	2854	2854	0%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	2846	2846	0%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	3119	2549	-18%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	3120	2550	-18%
4	SJR 4A1	Sack Dam to Hwy 152	2886	2315	-20%
	SJR 4A2	Hwy 152 to Sand Slough Connector	2886	2315	-20%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 4B2	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 4B2	Mariposa Bypass to Bear Creek	2887	2317	-20%
	SJR 5A	Bear Creek to Salt Slough	3094	2676	-14%
	SJR 5B	Salt Slough to Mud Slough	3250	2833	-13%
	SJR 5C	Mud Slough to Merced River	3308	2922	-12%

## Temperance Flat Reservoir Project

**Table 23-5.** Summary of Floodplain Activation Flow Analysis for Wet Years under 2070 Conditions

2070 Conditions - Wet Years					
SJRRP Reach	EDT Reach	Description	Without Project (cfs)	With Project (cfs)	Percent Change (-50% to 50%)
1	SJR 1A1	Friant Dam to Hwy 41	6103	4006	-34%
	SJR 1A2	Hwy 41 to Hwy 99	6331	4224	-33%
	SJR 1B1	Hwy 99 to Hwy 145 (Madera Ave.)	6620	4502	-32%
	SJR 1B2	Hwy 145 (Madera Ave.) to Gravelly Ford	6785	4660	-31%
2	SJR 2A	Gravelly Ford to Chowchilla Bypass	6854	4726	-31%
	SJR2B1	Chowchilla Bypass to Mendota Bypass	3755	4500	20%
Mendota		Mendota Bypass	N/A	N/A	N/A
3	SJR 3B	Mendota Bypass return to Avenue 7.5	5284	3632	-31%
	SJR 3C	Avenue 7.5 (Firebaugh) to Sack Dam	5285	3632	-31%
4	SJR 4A1	Sack Dam to Hwy 152	5073	3421	-33%
	SJR 4A2	Hwy 152 to Sand Slough Connector	5073	3421	-33%
	SJR4B 1A & 1B	Sand Slough Connector to Turner Ave	476	476	0%
	SJR4B 1C and 1D	Turner Ave to Mariposa Bypass	476	476	0%
5	SJR 4B2	Mariposa Bypass to Bear Creek	8976	4496	-50%
	SJR 5A	Bear Creek to Salt Slough	10707	6774	-37%
	SJR 5B	Salt Slough to Mud Slough	10865	6924	-36%
	SJR 5C	Mud Slough to Merced River	10969	7028	-36%





## EXHIBIT 24 FLOODPLAIN ACTIVATION ANALYSIS PROCEDURE

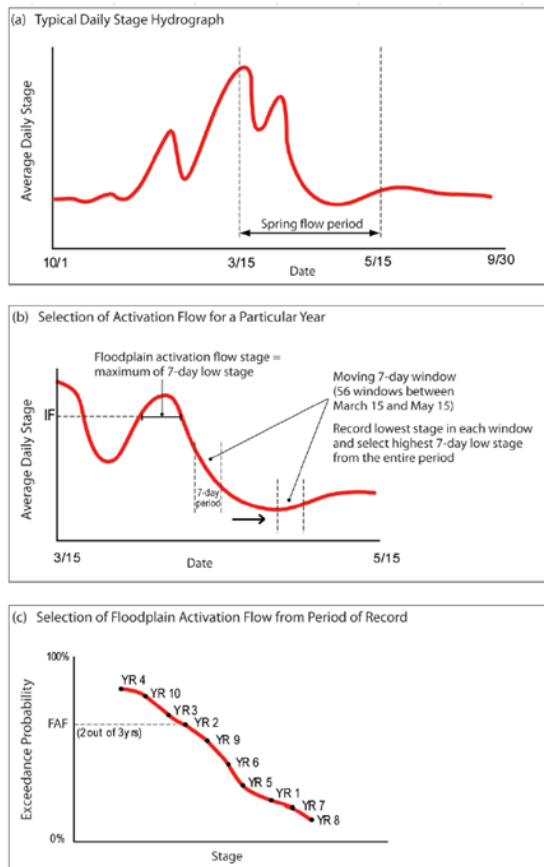


Figure 24-1. Example of Floodplain Activation Analysis Procedure



EXHIBIT 25    REFUGES IN THE EXTENDED PROJECT AREA

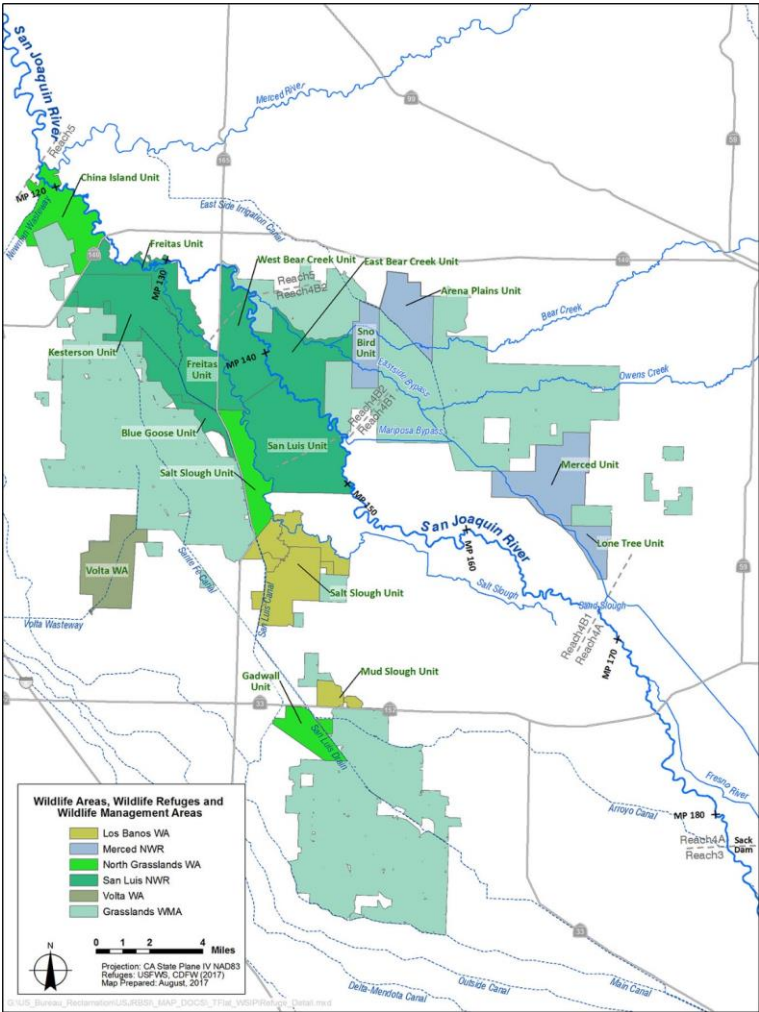


Figure 25-1. San Joaquin Valley Wildlife Areas, Wildlife Refuges and Wildlife Management Areas in the Extended Project Area.



Temperance Flat Reservoir Project